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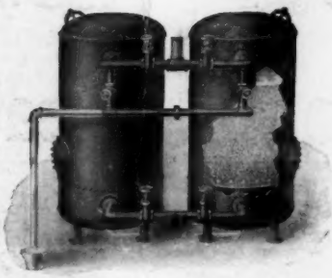

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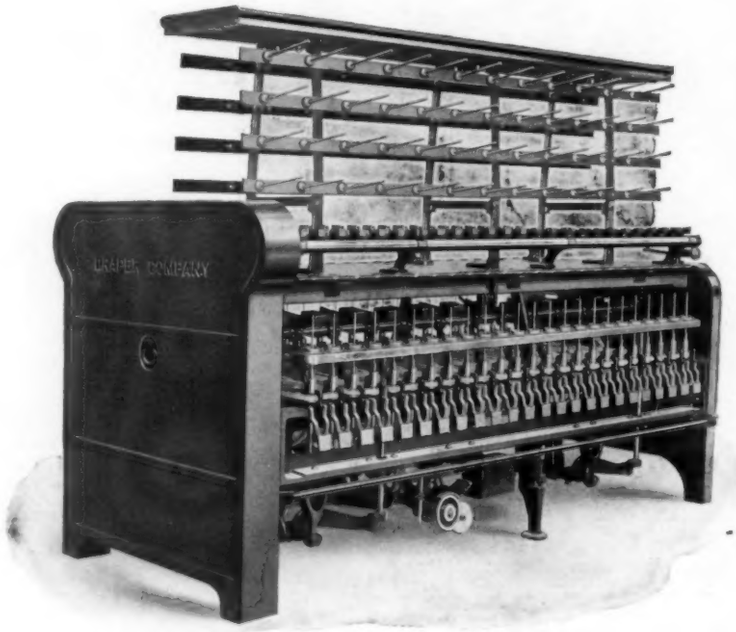

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SCIENTIFIC MARKETING OF COTTON.

At the annual meeting of the State Farmer's Union of South Carolina, a committee was instructed to issue an address to the people on cotton marketing, and to draft a bill for introduction at the next meeting of the state legislature, which will be in conformity with the recent decision of the Supreme Court on the State Warehouse Act.

It is claimed by this committee that the marketing of cotton is of worldwide import, because,

"1st. Cotton is an export crop the surplus sold abroad fixing the price of that which enters into domestic consumption.

"2d. This being true, the price of cotton is fixed not in relation to the supply of gold in the United States, but in the cotton manufacturing centers abroad."

The remedy they propose is to bring the producer and the spinner together through a system of government warehouses, which will become the basis of a foreign and domestic system of banking and which will reduce interest rates and relegate money to its only legitimate function—a medium of exchange.

The recent decision of the Supreme Court is of far reaching effect, greater, perhaps, than now realized for it gives a broad interpretation of the powers of the state in protecting its citizens from combinations which would confiscate property by destroying the profits arising therefrom. The South Carolina decision marks a new era and will be the authority most quoted in the questions now pressing for solution.

Heretofore, under former methods of marketing in competition with each other, all charges, including transportation, have been borne by the producer. Under the scheme proposed, the expense of marketing will be in the nature of a tax on consumption, shared by the consumers of cotton the world over, and every economy which can be introduced will inure to the benefit of both producer and consumer.

They call the attention of the bankers to the report of the banking committee of the State Union, and earnestly request the assistance of local banks, and suggest that early arrangements be made to secure sufficient funds or to get assurances of extension which will avert the disasters of last fall.

They tell the manufacturer that the new bill does not seek to deprive them of just profits and they appeal to the laboring man to help them increase the profits on the farm to a point where labor from the country will not seek the town to compete with town labor and make still higher the cost of living.

The bill, which is intended to regulate the ginning, baling, inspecting, warehousing and marketing of cotton and other products, provides for a commission to study all the conditions of growing and handling cotton and to determine upon the best system of ginning baling and covering; one of the objects of this act being to secure a uniform bale that will make South Carolina cotton distinctive in all the markets of the world.

This commission is to be empowered to appoint inspectors for both private and public gins to see that proper bagging and ties are used and that there is no false packing or excess tare. It is also the duty of this commission to establish by lease, purchase or building, as many warehouses as may be necessary to store and gradually market the crop in an economical and efficient manner and to appoint managers and other employees necessary to carry out this plan. Inspection tags and warehouse receipts shall be so designed that the brand "South Carolina" will be unmistakable, and shall set forth the weight, grade and length of staple of each bale.

In outline this bill is similar to the methods suggested by Major John M. Carson of the Bureau of Manufacturers in the May 1912 issue of COTTON, with the exception that it would be under state instead of federal supervision. The principal objection to state supervision would be the difficulty in securing uniform conditions in all the cotton growing states.

WHAT SHOULD BE DONE WITH THE SMALL MILLS?

A little over a year ago an article was published by COTTON entitled "The Problem of the Small Mills." Mr. Corley, the author of the article said:

"The time has come when the owners of the small cotton mills in the South, and by small mills I mean those of 10,000 spindles or less, are beginning to realize the difficulty of competing in a satisfactory manner with the larger mills. Indeed it is only by reducing the cost of production to the minimum that any of our mills, at the present time, whether large or small, can make any money and there are many reasons why this process of cost reduction, reaches a limit sooner in the small than in the large mill. If we study the situation closely we will see that the elements that tend toward extravagance and high cost of production in the small mill may be divided into five principle classes:

(1) Exorbitant over-head expense in proportion to capital.

(2) Exorbitant expense of supervision in proportion to capital.

(3) High cost of selling.

(4) Wastefullness in buying.

(5) Low production and low quality due to an attempt at producing too many numbers in so small a plant, necessitating too frequent mechanical changes; also the inability or disinclination to pay for the right kind of supervision."

He considered that the last or fifth cause was, perhaps, the most dangerous of all and said that "herein lies one of the worst disadvantages of the small mill and one that is equally as peculiar to and inseparable from it as the relatively high cost of supervision. Where a mill is large enough to do this frequent changing without keeping half of its machinery stopped, or where specialties are being made and a fair price charged which is based on actual cost, this kind of thing is alright, but for a little mill, running on a staple product that must be sold in competition with the most efficient plants in the country, to be changing its product every time the wind changes, is foolhardy. A tremendous loss in production under such conditions is unavoidable and quality is bound to suffer likewise. Such a mill ought to be carefully balanced on one number, and then with nothing to do but grind it out, a well paid second hand should be all sufficient; that is a man to work, not to boss. Let the superintendent do the bossing."

At the time this article was published, many commendatory letters were received from Southern cotton manufacturers, but the following extracts cover the three general classes of replies.

President C. E. Graham, of the Camperdown Mills of Greenville, S. C., who was actively engaged in managing a spinning and weaving mill said: "I have read with much interest the article in the May edition of COTTON on "The Problem of the Small Mills," which ought to be published and sent broadcast all over the country with a view to discouraging the building of small mills. The time has come when they cannot be operated successfully, which means a complete loss to the stockholders and a menace to the cotton mill industry."

Asa G. Candler, of Atlanta, wrote: "While I am not connected directly with any cotton mill, having disposed of my interest in the Witham Mills, I am interested generally in this paramount Southern industry. Mr. Corley is eminently correct in his discussion. The solution of the problem of the Southern cotton mills is not only larger mills, but higher class product.

"Some years ago, when Southern men determined to manufacture goods at home rather than allow the raw material to be taken away from the South, they made the mistake which is too often made by Southern manufacturers, in producing only the lowest grades of goods. I regret to note that this policy is not confined to the cotton mills, and until we are willing to allow our enterprises to be 'fertilized' by their own product long enough to produce rich crops just as we do in our fields, instead of paying early dividends at the expense of the product, we will continually be suffering under the grinding wheels of poverty."

The following extracts from a letter from A. O. Murphy, the treasurer of the Georgia Underwear Co., of Barnesville, Ga., gives the point of view of the knit-goods manufacturer.

"I cannot tell when I have read an article upon the industrial situation that has struck me with more force than that in your issue of May by Mr. Corley. This article strikes directly at the core of the situation and the suggestions given by him and the conclusions reached from the facts presented should receive the earnest consideration of those interested in the cotton mill industry of America.

"Every fact related by him in regard to the situation in the spinning line of the industry applies with equal force to the underwear line. The Carolina mills have given tangible evidence of the fact that they have reached the same conclusion by combining their mills under one head in mergers of $10,000,000 to $15,000,000 each. In my opinion it is the only feasible course to pursue to meet the present emergencies and to forestall any such conditions in the future.

"The small mill cannot compete nor work out any profit under the adverse conditions of the present day because the overhead expenses are too heavy for the production and volume of business obtained. Nor can the small mill handle the buying and selling end of the business in such manner as will enable it to compete with the larger mills.

"The sooner the entire cotton industry of America realizes the facts as set forth by Mr. Corley the sooner will cotton mill stock be considered a safe and profitable invest-

ment. If the entire Underwear industry of Georgia were merged under one head the stockholders thereof would receive more satisfactory returns and the trade would get better service. Hence it is that such a move on the part of the cotton manufacturers could not in any sense be considered a trust or in any way interfere with legitimate competition, but would conserve the best interests of all concerned."

These facts and opinions were again brought into prominence by a recent compiliation of statistics in the Charlotte Observer. It says, "of the 768 cotton mills in the South today only 31 are standing idle and all of these, with possibly one or two exceptions are shut down for reasons peculiar to each individual plant and not by reason of any depression of the industry."

These 31 idle mills represent 209,935 spindles and 4361 looms or an average of about 6772 spindles and 15 looms per mill. Five of these mills are of 10,000 spindles or over which if deducted from the total would leave a spindle average for the other 26 mills of only 4089 spindles per mill. These 26 mills come easily into the category of mills outlined by Mr. Corley and the other writers quoted. Would it not, perhaps, be wise for the stockholders of these small mills to take steps toward forming mergers of the several mills located in approximately contiguous territory? Such a merger, with one main office in a convenient city to handle the buying and selling end of the business and to distribute orders for product to the mill best fitted to produce the particular grade desired, would seem the ideal way of solving this difficulty of the small and idle mill.

Don't wait for the other fellow to take the initiative!

Don't wait for some professional promotor to step in and by the methods known only to "high finance" get away with what little you have left!

Make an immediate effort to cooperate with your neighboring manufacturers and solve this problem for yourselves!

WHICH IS THE REAL REFORMER?

The report from the Federal Bureau of Labor to be found in Vol. XVI of the Report on Women and Child Wage Earners, on typical cotton mill workers, has been widely criticised as unfair and unjust to Southern cotton mill people.

Commenting on this report before the American Cotton Manufacturers Association in Washington last April President Ellison A. Smyth said:

"One glaring ommision that is always found in the so-called investigations of professional philanthropists or paid emmisaries, is a fair comparison of present conditions and standard of living with former surroundings, and in this report it is conspicuously lacking. It is also noticeable in the so-called investigations of Southern mill conditions, that isolated cases of hardship and low standard of living are greatly exaggerated, and the many mill villages of our Southern states, with a contented prosperous population, surrounded by many comforts and maintaining a high standard of living, are purposely overlooked and unnoticed."

It will therefore be of interest to many of our readers to note the extended review given in this issue to the new book by Major Thomas R. Dawley, Jr., entitled "The Child That Toileth Not." It is, perhaps, only a curious coincidence, but not only did the Bureau of Labor decline to publish the complete results of Major Dawley's investigations as a special agent, but, many publishers, a few of whom have seemed rather over anxious to publish material depicting the terrible conditions of child labor in the cotton mills, also declined to handle this interesting narrative. They evidently believed in the old axiom of P. T. Barnum that the American public likes to be fooled, and did not care to risk the recognized reputation their magazines had already achieved by publishing a contradictory, even if truthful article.

Which accomplishes the most actual good for these children, the flotsam and jetsam of the mountain districts; the continued wailing of the child labor reformers, with the occasional accompanyment of legislative enactment; or the cotton mills, where they are provided with the means to secure food, clothing and education?

The largest single element in the import trade of South China through Hongkong is cotton goods and cotton yarn. Taken as a whole, the year's business in both lines was far from satisfactory.

The yarn trade opened up briskly at the beginning of the year in sympathy with rising prices for cotton staple and a general bull movement in the trade. Prices for raw cotton came to such a point, however, that Europe drew. heavily on India for staple and China refused to pay the high prices demanded for India yarn. In September, when prices ran lower, it was expected that a considerable business could be done, and heavy orders were placed. With the outbreak of the revolution, however, came a closing of the interior markets, and the result was an immediate piling up of stocks in Hongkong. Stocks during the year averaged about 50,000 bales monthly, but the stock ordered in September for Chinese trade ran to about 250,000 bales. With the outbreak of the revolution monthly clearances fell to as low as 6,000 bales, and with the notable fall in the prices of Japanese yarn soon after there was all but a collapse of the trade.

Prices during the first half of the year ran about $140 Hongkong currency ($60 gold at average exchange) per bale for 10s $145 ($62.30 gold) for 12s, and $160 ($68.60 gold) for 20s. By the close of the year they had fallen, on an average, about 15 per cent for the 20s and about 10 per cent for the 10s and 12s. The tendency at the opening of the current season was downward.

The various articles grouped under manufactures of cotton that were imported into Egypt in 1911 amounted to $22,589,310. Of this vast sum the cotton manufacturers of the United States furnished $2,920. The material furnished was canvas for sails. Egypt's total importation of this material amounted to $146,310. Importations of thread and yarn amounted to $1,615,110; cloth, waxed and tarred. $202,605; and cotton cloth, known locally as "Manchester goods," $20,625,285.

Exports from Egypt to the United States in the same year amounted to nearly $16,000,000, while the total imports from this country was about a tenth of that sum. Why not even up the balance sheet with a few more manufactures of cotton?

THE STANDPOINT OF THE FINISHER.

A few of the Difficulties that cause a more or less spirited triangular warfare between the Manufacturer, the Finisher and the Converter.

(Contributed Exclusively to COTTON.)

BY JOHN P. FARNSWORTH, PRESIDENT, PROVIDENCE DYEING, BLEACHING AND CALENDERING COMPANY, PROVIDENCE, R. I.

A large proportion of the cotton cloths manufactured in this country is bought in the grey or unfinished state and sent by the converter to some finishing works where it is put in the desired condition for market; that is, either bleached, printed or dyed. Only the largest manufacturers can economically finish their own product except in the case of specialties, where the same process is repeated on all classes of goods. This is owing to the great variety of cloth, the still greater number of finishes, and the extreme cheapness with which they are done when a large quantity is handled.

I intend to indicate below a few of the questions that come up to vex the manufacturer, the finisher and converter, resulting in a more or less spirited triangular warfare between them. When these questions come up the converter feels that he is between Scylla and Charybdis, and that he is in for a loss anyway; the finisher feels many times that he is not fairly treated because when anything is wrong it is always laid to him first; the manufacturer takes the ground that there are many chances in the finishing works for damage and that he should not be responsible when the goods have been out of his hands so long and subjected to such changes.

There is, of course, a middle and fair ground from which all these disputes should be viewed. Scarcely one of those I shall indicate but what can with a little care and reasoning be settled fairly to all parties. Yet the warfare goes merrily on with more or less hot blood between the three parties to it.

I make no suggestion as to the way to end the friction, except that of proper arbitration and a sincere desire on the part of each to take the blame that properly belongs to them, and an impartial investigation would generally place the blame where it belongs.

It has become the custom for the finishing works to act as the agent of the converter in receiving goods, and he is in all cases supposed to see that the goods are in "apparent good order" as far as outside appearances go. When it comes to opening the bales and taking responsibility as to the quality, however, the finisher generally halts. He counts a few pieces, weighs them, cuts off swatches, and reports all to his principal. He does not as a rule attempt to criticise the goods, but upon request looks over some of the cloth and calls attention to defects.

In general, however, no comments are made if count, weight and yardage seem to be right. The converter sees only the swatches and very often pays no attention even to them, trusting to the reputation of the mill for getting goods that will be considered by his customers as first quality.

The responsibility for acceptance of the goods in the grey as firsts is therefore entirely off the shoulders of the finisher; but when the goods are finished his trouble begins. In many plants little attention is paid to faults that are evidently due to mill troubles, and in such a method of handling the finisher is technically in the right. The goods are supposed to have been carefully inspected at the mill and only first qualities packed. But finishers who desire that the interests of their clients shall be safeguarded are under the necessity of giving their help a standard below which goods shall be classed as seconds. If this is not done and the goods are cut into garments, as most cottons are today, the imperfect parts are made up along with the perfect, and claims for loss and damages are made on the part of the cutter. The damages being obviously due to imperfect manufacture the finisher will not settle for them, and the goods having been changed in condition and cut so that the manufacturer cannot be sure that they are his goods, the mill refuses to settle, and the converter either settles or loses a customer, possibly both.

The price at which cotton goods of average quality are finished absolutely precludes any close examination and selection of the goods in the grey, except at such a cost as no converter would be likely to stand under ordinary conditions, and moreover if the finisher should consent to stand as arbiter of first quality he would find himself practically boycotting some mills or boycotted by them, for "one mill's firsts are another mill's seconds," and what will pass in one grade of cloth and for one use will never go in a little higher grade or for some other purpose.

When the goods are finished to what extent they shall be culled is a serious question. Shall three or four imperfections of minor character go to make a piece second quality, or shall such a number be the limit for firsts? Shall the finisher cut out two or three bad inperfections and so make short lengths, or shall he turn the whole piece into seconds? Such questions as these make the life of the finisher anything but a happy one. The writer has in the same mail been criticised as too careful in culling by one customer and as too careless by another for the same classification of goods from the same mill.

This triangular responsibility exists where the imperfections are evidently of mill origin and so acknowledged by the manufacturer. There are many imperfections that it is hard to assign responsibility for, such as damage in transit that is not so plain as to cause a claim on the transportation company or damage for which the transportation company will not eccept responsibility. Bales are burlapped only top and bottom; they lie around in a storehouse for some time, they are shipped on their sides in dirty cars and thrown around on freight house floors, and the dirt is so rubbed in at every fold and every selvage that no finisher can with ordinary process get them clean. A black streak goes across every yard of the bleached product; oil or tar or acid that might come from the mill, from the freight cars, or from the finishing works filters through the burlap.

At times a black or rusty spatter will come up on the finished white piece. Does it come from the loom where

the pick movement is too heavily oiled, or does it come from the packing of a set of drying cans? Threads are left hanging on the face of a piece of goods where the filling has given out or the warp has broken; when the piece passes over some of the finishing machinery it drags the thread in the oiled parts and leaves a long trail of black. Is it the fault of the finisher or of the mill whose inspection was careless?

A serious loss to someone and generally to the finisher is caused by the carelessness of the mill inspection in cutting the ends of pieces diagonally, sometimes one side being nine or ten inches longer than the other, and as the same operation is repeated at each end and the long ends are counted by the mill, as perfect yardage, the manufacturer gets paid for ½ yard of useless cloth on every fifty, or 1 per cent of the bill extra. The finisher cuts each end square so that the goods can be sewed straight, and the converter wonders where his stretch is going. Take this fault in connection with the custom that some mills have of figuring 35½ inches to the yard, and the converters complaint is often justified.

Another sore point with the finisher is the careless habit of mill operatives of leaving pieces of metal, large or small, imbedded and sometimes woven into the cloth, and the consequent damage and loss when the goods are run through the heavy rollers of the finishing plant. Nothing used about the mill seems to escape the weaver in his experiments to see what a varied assortment of metal can be gotten into a piece of cloth. The smallest pieces of brass or iron, tacks from the felt drag in a shuttle, screws from electric light fixtures, the brass ends of yardsticks, whole or broken travellers possibly hanging to the yarn, in fact any old thing used in a mill. I have seen a heddle some twelve inches long woven neatly into a piece of plain cloth. Stranger still is it that under the close inspection the goods are supposed to get all these things will pass. In fact I believe the inspector adds his or her quota to the miscellany by inserting pins to mark damages or breaks and forgetting to remove them. I have in my office two pairs of pliers such as are used by inspectors that came to us in fine yarn goods.

Of course all these tokens of careful (?) inspection are likely to be held in the goods until opened up through a mangle, where they imbed themselves in the husk roll and cut at each revolution until some one finds the damage and its cause.

Generally the cut is so obvious that only a few yards are damaged, but with the speed at which goods are run and the wet and contracted condition of the goods, a small hole may go on until discovered in a later process. Rolls in a finishing plant are carefully examined from time to time for just such troubles, and yet there is a large loss every year from these causes. All of this is entirely due to carelessness at the mill, yet a claim for loss by damage would in most cases be thrown out of court.

A mill is weaving two or more grades of cloth that are somewhat alike but with differences of count and weight. By accident a piece of one grade is baled with 49 pieces of another. The goods are finished and in the casual inspection for quality given by the finisher the piece passes on to the cutter with the other forty-nine; it is cut up with the others and forms a part of possibly ten dozen garments. On inspection the cutter finds it in all these garments and throws them out as seconds or worse. Claim is made on the converter who passes it back to the finisher, who unless he can get the tarmark or distinguishing letters that he has given all of the bale, cannot be sure that his own people are not at fault and pays the claim. Yet ninety-nine times out of a hundred it is the fault of the mill because every bale in a finishing works must have the same mark on all its pieces owing to the way the goods are stamped. Even if it were proved that the mill were at fault they would be likely to fall back on the stock excuse "that the character of the goods is charged," and they would not accept responsibility.

Another thoughtless trick of the mills is to mix dark Egyptian and white filling and warps in the same piece and bale and contract. Or as a variation on that they give us in place of Egyptian a Blue Bender Cotton that is practically "fast to bleaching."

Sometimes when a mill changes from dark to light cotton the yarns will be mixed up and a streaked piece of goods results that no care can ever make perfect; the look of the hybrid clings to it no matter how well finished.

The finishing world is now in the midst of such a season of mixed white and blue cotton; contracts are sold from the white cotton and goods delivered made of mixtures wholly of blue cotton. The result is going to be that the cheaper grades of underwear will soon be like Joseph's coat.

MILL LIGHTING.

BY G. H. STICKNEY.*

In mills and other industrial establishments economy is apt to delay the adoption of new improvements requiring an initial expenditure. However, economy is the very demand which is today compelling the adoption of the new lighting units and improved methods for mill lighting.

The fundamental and primary purpose of mill lighting should be to insure safety to the employee. The second and usually the severer requirement is economy of production. All must clearly understand that the light in the mill is for the use of the employee, to enable him to see to perform his duties safely and expeditiously.

With proper illumination it is possible to obtain a larger production, and a better grade of product, with a smaller loss of material through defects or breakage. The gain in any one of these three factors, will almost invariably more than outweigh the cost of reasonably good illumination.

The expenditure necessary to modernize lighting in any mill is a relatively small item compared with the cost of the year's operation, and if capitalized according to the usual practice of figuring, depreciation and interest will prove a comparatively small item.

One must not make the mistake, however, of trying to humor the whims of the workman. The average workman is not an illuminating engineer. Unfortunately, he often fails to realize it. It has been observed that when the workman is allowed to use his own ideas he is inclined to use bare glaring lights, so that they shine in his own eyes or those of his fellow workmen. This results in the demand for an intensity several times greater than is really necessary, and instead of facilitating his work actually retards it and injures his eyes

*Extracts from a paper read before the Philadelphia Section of the Illuminating Engineering Society.

An interesting case of this sort was reported sometime ago by L. B. Marks, who found that the workmen in a particular factory were able to work satisfactory with a daylight intensity of eight foot-candles but insisted that they required 72 foot-candles under artificial lighting. By re-arranging the lighting, he was able to provide evenly diffused illumination of reasonable intensity which was not only much better for the workmen but reduced the lighting cost.

In actually planning a mill lighting installation there are three principal factors to be considered, in order to secure the best possible result; first, process to be lighted; second, construction of the building; and third, the illuminant available.

As far as lighting is concerned this class includes knitting mills, print works, and all textile dye houses. The lighting requirements for cotton, linen, wool and silk, corresponds somewhat for similar processes, varying in degree, in that the darker and finer grades of goods require higher intensity and better illumination than the coarser and lighter colored grades. In all these textile mills the

G. H. STICKNEY.

illumination requirement becomes more severe as the finishing process is approached. That is, the weaving and inspecting require better illumination than the breaking, carding, and spinning. In lighting a weave room the size and arrangement of the looms should be considered in determining the size and location of lighting units. Especially with high looms care must be taken to locate lamps so as to avoid objectionable shadows. It is necessary for the operator to see the separate threads of the warp and detect breakage or other irregularities in the weave. The breakage of a single thread, if not immediately detected, may spoil a valuable piece of cloth. After weaving, the cloth is usually inspected on the tables or reels and a relatively high intensity of light is required, especially with black goods. In some cases, daylight quality of light is necessary. In dye rooms a moderate illumination is all that is required, except for the inspectors office where a color matching light is required for the illumination of samples.

Diffusion and direction of light are two important characteristics of good mill lighting. If the diffusion is good, the requirements for direction are less severe; and on the other hand with suitable direction of light it is possible to get along satisfactorily with less diffusion. A combination of glare and wrong direction of light is a common and serious fault. Diffusion is usually obtained by the use of translucent glassware, or diffusing reflectors. It is invariably accompanied by a loss of light, which is to a certain extent dependent upon the degree of diffusion obtained. Particularly where considerable dust and flyings are present, accumulations of dirt on the glassware tend to reduce the glare and also to increase the loss of light. In such cases the use of clear glassware is not so objectionable as would appear at first thought. Frosted glass and rough surfaces tend to facilitate the accumulation of dirt and dust and, hence, should not be used in such places. Glare is almost always objectionable.

Another important feature of mill lighting is the distribution of light. The workman's attention is more readily directed to the points where there is high illumination. Whether the lighting should be approximately uniform or concentrated in spots, depends upon the nature of the work. Usually there are places in mills which require more intense illumination than other parts. In some cases it is practicable to arrange the lighting so that the most important machinery receives the strongest light while the intensity grades off to the less important parts of the room. The danger, however, is that the spotted lighting will not vary according to the requirements For example, in weaving, the warp requires approximately equal illumination for its full width. A bright spot of light in the middle of the warp may interfere with proper observation of the selvages, rendering the lower intensity less effective by contrast.

A few years ago there began to grow up two distinct classes of practice in regard to lighting, which have been designated "general illumination" and "local illumination." The use of the incandescent lamp favored local illumination, because of the relatively inefficient units then available. The use of the arc lamp favored general illumination because of the inherent high capacity of the unit. The breach between the two methods of lighting appeared to be widening until the advent of the tungsten filament lamp provided an intermediate sized efficient unit. To-day there are certain problems which distinctly favor localized illumination, while others can best be solved by general illumination. In the majority of mill lighting problems, however, neither of these extremes provide the best solution. The tendency today is to provide a relatively even intensity of illumination with moderate sized units, which can be arranged to concentrate the intensity where desired, and also to provide suitable direction of light.

Ordinarily, it is sufficient that the color of light should approximate daylight near enough to make objects appear natural. It is desirable that the variation from white should be towards yellow, which is more agreeable than blue or green. In special cases, such as textile and other dye rooms, where color matching is required, an especially close approximation of daylight is necessary.

The following figures will give an approximate idea of the intensities used in present practice:

Process.	Foot-Candles.
Warehouses and store rooms	1 to 3
Passages	¾ to 1
Weaving	3 to 6
Spinning	1 to 4
Carding	1 to 3
Breaking	1 to 2

Building construction is a factor which does not always receive proper consideration in the designing of a lighting installation. Many of the older mills have low ceilings with wide floors which are rather difficult to light satisfactorily. It is not uncommon to find ceilings as low as eight feet. The modern mills, as a rule, have higher ceilings.

The author has been called upon for advice in lighting buildings where the owner was compelled to go to unnecessary expense because the designer had not provided for a suitable arrangement of outlets. It is good practice now to build mills and factories with a large window area, so that daylight can be utilized for fairly long working hours. This type of construction not only transmits the daylight freely, but also allows a considerable loss of artificial lighting. In clean mills where conditions permit, it is often advisable to install light colored shades over the windows, thereby strengthening the illumination near the sides of the room, and providing the diffusion. An illumination test in a clothing factory showed a gain of ten per cent in the illumination on the horizontal working surface eight feet from the window when the shades were drawn. The additional light was rendered more than ordinarily valuable by its diffusion and direction.

It is advantageous when possible to provide light colored walls and ceilings to reflect and diffuse the light. Many mills make it a practice to whiten their walls at least once or twice a year. In a large room where various processes are carried on, it is a good practice to have the artificial illumination slightly stronger in the parts of the room near the window. In arranging the room for daylight operation those processes which require most light are placed near the windows, so that a more intense illumination is likely to be required there than elsewhere. Arrangement of lighting depends to a certain extent upon the arrangement of pillars and ceiling girders. The location of outlets should be symmetrical so as to make a good appearance and avoid post shadows. If tungsten-filament lamps are used, the size can usually be selected to correspond to the construction.

It is not expedient to discuss in this paper all the various types of lamps, used in mill lighting. Each lamp has its peculiar advantages and limitations. No one unit is the best for all classes of lighting. The author has been asked to discuss particularly the use of tungsten lamps with metal reflectors. The economy diffuser was probably the first of the metal reflector equipments to follow the development of the tungsten-filament lamp. With this diffuser five or six lamps, not exceeding 100 watt capacity, were grouped under a concentrically corrugated reflector, either 26 or 40 inches in diameter. A diffusing globe was providing to reduce the glare from the bare filament lamps. In general practice it was found that the globes collected considerable dirt, so that there was a tendency to remove them. The grouping also reduced the efficiency by cutting off light. There has been a tendency lately toward the use of single light diffusers which preclude this trouble and also decrease the maintenance cost through the use of larger lamps. An excellent installation using the economy diffusers is the Adler clothing factory in Rochester. In the installation on the fourth floor, the 40 inch economy diffuser is used with 3-100 watt and 3-40 watt tungsten lamps. With a consumption of 1.8 watts per square foot, they were obtaining 6.5 foot-candles, or 3.6 useful lumens per watt. The measurements were made over a year after the installation was put in.

There are a number of excellent makes of steel reflectors which have reflecting surfaces of aluminum matte, porcelain enamel, etc. The so-called selective diffusing reflectors are made in two sizes, 16 and 21 inches in diameter. The 16 inch diffuser, has a 2¼-inch collar and is intended for use with tungsten lamps up to and including the 250 watt size. The 21 inch diffuser has a 3¼-inch collar and is intended for use with 250, 400 and 500-watt tungsten lamps. At first these diffusers were finished with paint enamel on account of its highly efficient reflecting surface, but as the surface did not last, the advantage of this efficiency was soon lost. The finish has since been changed to porcelain enamel, and the high efficiency has been retained by the use of an unusually heavy coating of white enamel. An illumination test was made with 250 watt tungsten lamps equipped with 16-inch diffusers as installed in the induction motor department of the General Electric Company in Schenectady, N. Y. This building is about 60 feet wide and is divided into three bays; the height of ceiling is 24 feet, the height of lamps is 23 feet; the consumption was 1.02 watts per square foot and an illumination on the working level of 4.8 foot-candles, or 4.7 lumens per watt obtained. The lamps were suspended beneath a gray concrete ceiling, and subsequent tests showed that substituting 21-inch diffusers increased the average illumination on the working level about 8 per cent; while the use of the 16-inch diffuser gave 21 per cent more light than when the ceiling only was depended on for reflection.

TEXTILE FINISHING IN NEW ENGLAND.

THE ADVANTAGES TO BE DERIVED FROM LOCATING A FINISHING PLANT IN THAT PARTICULAR SECTION.

BY FRANK E. BURBANK, GEN. MGR. BARROWSVILLE, BLEACHERY.

The finishing of cotton textiles in New England dates back to about 1812-13. About this date a plant was operated at Dighton, Mass., while what was later known as the Allen Print Works in Rhode Island was founded about 1815. In 1817 a bleachery was established at Waltham, Mass., where the present Waltham Bleachery is located.

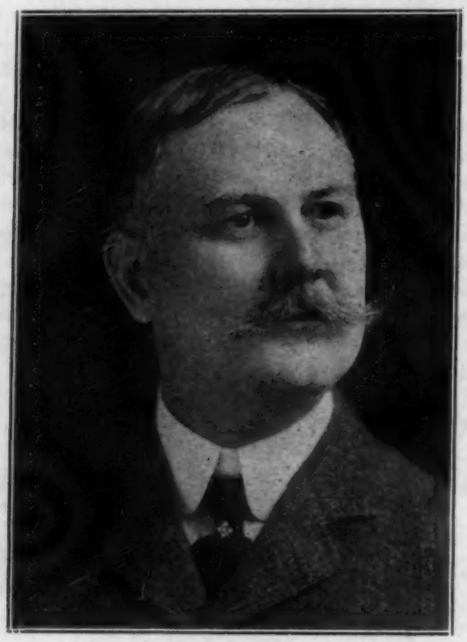
From such small and early beginnings as these grew the immense finishing plants of the present day with aggregate capacities capable of turning out hundreds of tons of finished goods per day. This is not taking into consideration the print works or finishing plants that are directly connected with their own cloth manufacturing plants or mills.

It is, perhaps, needless to say that our finishes on cotton piece goods are not equal to the foreign, or more strictly speaking the English, for the reason that our plants are run at a much higher speed. We work faster and turn out a greater quantity of product and therefore lose to a certain extent in the quality of that product.

Perhaps the primal reason why the finishing industry thrives in New England better than in other sections of the country is because, as shown above, this section was the cradle of the industry, which it nurtured in its infancy. Moreover, until recent years the bulk of the cotton cloth manufacture in America was centered here and by locating the bleacheries in close proximity to the mills, a decided advantage was gained in the matter of freight rates and quick deliveries on "grey goods" shipments.

This neighborliness also works to advantage when by chance the finisher finds that the "grey goods" are not up to requirements, or as the invoice calls for. It is a very easy matter to have the superintendent of the mill that made the goods come to the finishing plant, even on very short notice; and such matters can be more satisfactorily adjusted by a call from the superintendent than by any letter writing ever done.

Another feature distinctly in favor of New England finishing plants in my opinion is the quantity and quality of the skilled operatives we have to draw upon. As in many instances, operatives came to this section from England and as already shown many native Americans have been connected with the industry from its infancy, a large



FRANK E. BURBANK.

number of our expert operatives today have behind them generations of equally skilled operatives. This feature is of value in any industry requiring skilled labor.

Equally as important as the question of labor is the question of water. Pure clean water and good experienced help are very essential for the proper finishing of fine cotton fabrics. My long experience in the finishing business has shown me that a good kier boil with pure water is about half the battle. This good clean water should also be at hand in sufficient quantities to allow for careful and thorough washing at every part of the bleaching process. In my estimation this water is obtainable in New England in sufficient quantities and in its natural state, in locations much more advantageous to the finisher, than in any other section of the country. I think we may truly say as cotton is to the South, so is the finishing plant to New England.

FEDERAL PROTECTION OF TRADE-MARKS

(Contributed Exclusively to COTTON.)

BY EDWARD S. DUVALL, JR., L. L. M. TRADE-MARK LAWYER.

February 20th, 1905, Congress enacted a law entitled "An Act to authorize the registration of trade-marks used in commerce with foreign nations or among the several States or with Indian tribes, and to protect the same."

Prior to this date, there was no federal statute, under which a trade-mark used exclusively in interstate commerce, could be registered in the United States Patent Office and no suit could be brought in a United States court for infringement of a trade-mark so used in inter-state commerce.

As most trade-marks in this country are used in commerce among the different States, to a greater extent than in trade with foreign countries, it was early recognized as a matter of great importance to manufacturers not only that legal trade-marks adopted for inter-state use, might be registered by the Government to establish *prima-facie* ownership, but when so registered they could be protected against infringement by suits in the courts of the United States.

The questions of greatest importance upon which enlightenment is usually sought by those engaged in business who own trademarks, are, what is a valid trade-mark and what benefit is derived from registration in the United States Patent Office.

A trade-mark may be defined as a name, sign, symbol, or device which is applied or attached to goods offered for sale in the market so as to distinguish them from similar goods and to identify them with a particular manufacturer or trader, or with his successor, as owner of a particular business, as being made, worked upon, imparted, selected, certified, or sold by him. In order to safe-guard the good-will and reputation of a business, it has long been the custom to affix to the goods some particular mark to distinguish them from similar goods offered by others engaged in the same business. Broadly speaking, such distinguishing marks are trade-marks and their use has been wide-spread in all countries from very ancient times.

Manifestly the use of a trade-mark in connection with particular goods or a particular business is a representation that those goods or that business are the goods or business of the person to whom the trade-mark belongs, that is, with whom the trade-mark has become identified. Ownership of a trade-mark is created by two necessary steps, first by adoption of a name, sign, symbol or device and second by actual use of the same on goods in commerce.

The title begins from the date when the trade-mark is so used for the first time. Many trade-marks adopted and used in business are not recognized in law, as legal trade-marks, that is to say, no exclusive right to the use thereof may legally vest in the person who adopts them. For example no one can claim the right to exclusively use a word as a trade-mark which is descriptive of the character or quality of the goods to which it is applied. Under the law descriptive words may not be exclusively appropriated as trade-marks. Even when used as such for a long time, the courts will not entertain a suit for infringement. The law however, does recognize an exclusive property right in the first to adopt and use a valid trade-mark and will protect the owner against unlawful use or imitation there-

of. If words are to be employed as trade-marks they should be fanciful or arbitrary.

Contrary to popular belief ,a mark must be used in commerce before it becomes a trade-mark and may be lawfully registered. Ownership of a trade-mark is of common-law origin while registration is a statutory right. Registration is notice to the public of the claim of ownership of a trade-mark, and the certificate of registration granted by the United States Patent Office is *prima facie* evidence of such ownership. Registration confers upon the owner of the trade-mark the right to sue in the federal courts for infringement of the trade-mark and the certificate is received as evidence of ownership without other proof.

Prior to February 20, 1905, only those trade-marks could be registered in the Patent Office which were used on goods in commerce with foreign nations or the Indian tribes. Trade-marks used in inter-state commerce could not be so registered. As a consequence, suit would not lie in the federal courts for infringement, where the infringer imitated another's trade-mark only in inter-state commerce. A suit would lie however for unfair competition in trade. This situation was remedied by congress by the enactment of a statute, on the above mentioned date, which provides for registration of trade-marks used in inter-state commerce as well as those used in commerce with foreign nations and Indian tribes.

Under this recent law a certain class of trade-marks known as non-technical trade-marks and not registrable prior to its enactment, are also permitted to be registered, where they have been used exclusively in inter-state commerce or in commerce with foreign nations or Indian tribes, for ten years prior to February 20, 1905. Included in this class of trade-marks are geographical names or terms, and the names of individuals, firms. corporations or associations. Before this law went into effect, such could not be registered because they were not lawful trade-marks. To entitle one to registration of non-technical trade-marks under this law, he must have enjoyed the exclusive use thereof for the prescribed period and where it is shown in proper proceedings in the Patent Office that others have used the same trade-mark on the same class of goods at any time within this period of ten years, registration will be refused.

The principle underlying this provision of the law is that of vested rights. The public having acquiesced in the use of the non-technical trade-mark for ten years and the origin of the goods having been identified by the public for this period, the owner is recognized to have established rights by long use which entitles him to protection. Hence this provision in the Act to permit the owner to register his trade-mark and sue in the federal courts to protect his rights, in the same manner as the owner of a technical or common law trade-mark.

It is thus seen that there are two classes of trade-marks, technical ones which have always been registrable under the Federal laws and non-technical ones which have been legalized by the Act of February 20, 1905.

However, where a technical trade-mark was registered prior to this date, a right of action for infringement accrues only where the unlawful imitation is on goods sold to foreign countries or in trade with Indian tribes. It therefore becomes necessary for the owner of the trade-mark using the same in inter-state commerce and holding a certificate of registration issued by the Patent Office prior to February 20, 1905, to re-register such trade-mark under the new law passed on that date, otherwise he is without adequate relief in the federal courts. Most manufacturers and traders have re-registered their marks.

Provision is made in the new law for notice to the public, through the Official Gazette of the Patent Office, of all applications for registration of trade-marks, which have been favorably acted on, before certificates are issued. Within thirty days after such publication any one may object to the registration if he would be damaged thereby, as is frequently the case where one who is not the owner of a trade-mark makes application for registration. Or it may be that two persons claim ownership of the same trade-mark. Again it may happen that one applies for registration of a non-technical trade-mark, claiming exclusive use of same for ten years next proceeding February 20, 1905, and another can show that he has used the same trade-mark during that period on goods of the same class. This provision of the law gives opportunity to persons to be heard in opposition to the registration of trade-marks where adverse rights are involved. The person desiring to oppose registration must file in the Patent Office, within the time just stated, a notice setting forth the grounds of his opposition and show wherein he will be damaged.

To register a trade-mark, a formal application must be made to the Commissioner of Patents. This application is in writing and following the requirements of the law, consists of a statement containing the name of the owner, his citizenship and residence, what class of goods the trade-mark is used on and the particular goods in that class, giving the date when the trade-mark was first used and how it is shown on the goods, which statement must be verified. This application must be accompanied by five specimens of the trade-mark as actually used on the goods and a drawing, illustrating what is claimed as the trade-mark. At the time of filing the application a fee of $10.00 must be paid to the Patent Office. Once the application is placed on file it is given a serial number and awaits its turn for consideration by the Examiner of Trade-marks.

While this official has a score of assistants, the large number of applications for registration filed each week, running well into the thousands, makes it not unusual for an application to wait a month before it is taken up for examination. When it is reached by one of the assistants, he sees to it first that the application is formal in its parts and then determines whether the applicant presents a trade-mark for which the law provides registration. If there is no statutory objection, as for example, where it is a technical trade-mark, if it is not a descriptive word or a geographical name or term, he then makes a search through all of the trade-marks which have been registered for the class of goods on which the applicant's trade-mark is used. It may be that he will find that some one else has registered the same trade-mark and if so, will write a letter to the applicant or his attorney, advising him that registration is refused because of the prior registration. If the examiner finds that the trade-mark has never been registered he will notify the applicant's attorney that the trade-mark will be published in the Official Gazette and if at the expiration of thirty days no one has filed a notice of opposition thereto, the registration will be allowed by the Commissioner. The certificate of registration is issued under the seal of the Patent Office and is forwarded to the applicant or his attorney.

It frequently happens that two persons or concerns, file interfering applications for registration of the same trade-mark. Before registration can be granted to either the law requires the Commissioner to ascertain by proper proceedings which is entitled to register the trade-mark. An interference is promptly declared to exist between the two applications, of which notice is given to each applicant or his attorney. Testimony is ordered to be taken in support of the claims of each and times are fixed for the taking of such testimony. When the proofs are filed in the Patent Office they go before an official designated as the Examiner of Interferences and each applicant is given the opportunity to be heard in person or by attorney to argue his side of the case. This official then passes judgment in the case and decides which of the parties to the interference proceedings is the owner and entitled to registration. If the losing party feels aggrieved by his judgment in the matter, it can be reviewed, on appeal, by the Commissioner of Patents.

If any trade-mark has been erroneously registered, provision is made in the new law for cancellation thereof by proper proceedings begun in the Patent Office, by any one who has been damaged by such registration.

On account of the understanding of the present law relating to trade-marks required for the proper presentation of an application for registration and the formal procedure attending an application after it is filed, as well as the frequency with which conflicts with other applications arise, this branch of the law has received the special attention of many able lawyers who devote their whole time and attention to such matters. Nearly all of the applications for registration are now prepared and filed by attorneys acting for the owners of the trade-marks. The cost of registration is small and the value thereof can not be lightly estimated. It is essential to every business that all established trade-marks should be registered in the Patent Office. Registration under state laws confers no rights or advantages outside of the state. Such registrations are purely local and in the absence of registration under the laws of the United States the registrant has no redress in the federal courts for illegal use of his trade-mark in inter-state commerce.

CALCULATIONS FOR PRICES OF CLOTH.

(*Contributed Exclusively to* COTTON)

BY J. W. K.

The method of quoting for the price of a piece of cloth may vary at different mills, but the following example may be useful to those who have had little or no experience in this matter. Now for example we will suppose that the cloth we have to quote for is a blue sateen to be 29 inches in the cloth, to contain 72 picks of filling per inch, the cloth to be 100 yards long, counts and other particulars not known, (we are supposing this to come from a customer), the first items we must ascertain are, viz.:

(1). Counts of warp and filling.
(2). Picks of filling per inch.
(3). Threads per inch in cloth.
(4). Quality of warp and filling used.
(5). Whether calendered, filled or finished cloth.

Having found these particulars, (the above only would be required in grey cloths), but in the example given we should have to find out whether the color was indigo, patent indigo, or an aniline color and fix on the depth of shade required as the sample.

These particulars having been decided upon, the weight of warp and filling is then calculated. On examination we find the cloth to contain, viz.:

Counts of warp = 20s American ring.
Counts of filling = 24s American ring.
The number of threads per inch cloth = 106.
Picks of filling = 72 per inch.

Now, 106 ends per inch × 29 inches cloth = 3074 threads in the warp, allow 6 threads per inch for shrinkage in width, then 3,075 ÷ 100 = 30¾ inches in the reed. For 100 yards of cloth allow 110 yards of warp. This warp is intended to be made on the sectional warping frame.

The cost for 20s American ring for warp is say 14 cents per pound, and the cost of 24s American ring for filling is say 15 cents per pound. The weight of warp will be:

3074 threads in the warp × 110 yards long ÷ 800 yards per hank allowing 5 per cent. waste × 20s count = 21⅛ pounds of warp.

To find the weight of the filling: 72 picks per inch × 30¾ reed space × 100 yards cloth ÷ 800 yards per hank × 24s counts = 11¼ pounds weft.

The weight of the yarn having been found, we proceed as follows:

Warp, 21⅛ pounds grey yarn at 14 cents per pound	$2.96
Dyeing 21⅛ pounds of warp at 6 cents	1.27
Sizing this warp at a cost of 2 cents	.42
Winding on bobbins at 2 cents per pound	.42
Warping at 14 cents per 1,000 hanks of 840 yards	.73
Beaming at 2 cents per cut of 100 yards	.02
Drawing-in 3,074 threads at 12 cents per 1,000 ends	.37
Total cost for the work	$6.19

We may next proceed to find the cost of the filling:

11¼ pounds of grey yarn at 15 cents	$1.69
Dyeing this yarn at 6 cents per pound	.67
Winding at 22 cents for 10 pounds	.25
Total cost of filling	$2.61

Adding to this the cost of the warp preparation of $6.19 gives a total of $8.80. To this must be added the weaving price of 97 cents and fixed costs and overhead expenses amounting to $1.58, which brings the total up to $11.35 for producing 100 yards of cloth. These prices are English costs converted into the nearest approximate value in American money.

A cheaper method would be by buying the yarn in warp from the spinner which would save reeling and winding, having the yarn dyed and sized in the warp and afterwards by dressing on the weavers beam. In this case the weft could be bought in cop and dyed and again save winding, but in setting out a piece of cloth the cheapest method is not always the best unless specially required. What we have to do is, to find the best suitable process, the most economic, and one that will make good warps, so that we can rely on good weaving and save loss in damaged cloth with a view to keeping expenses as low as possible. As previously stated, any other system of warping, etc., could be adopted; the main thing is, alteration in the prices.

The bleaching power of a bleaching liquor, and the rate at which it is spent, are factors which run parallel the one with the other.

THE CHILD THAT TOILETH NOT. *

How the Cotton Mills are helping in the Southern Social Problem—At last the Truth Prevails—An Interesting Narration of Facts.

It may be remembered by readers of COTTON that Thomas R. Dawley, Jr., a special agent of the Federal Bureau of Labor, was sent from Washington, D. C., some two or three years ago, to investigate the child labor situation in the cotton mills of the South, and that the result of his investigations was a decided conviction that not only were the representations respecting the employment of children in the mills based upon falsehoods and misrepresentations, but that instead of the mills being deterimental to the comparatively few children who do find employment in them, the mills proved of inestimable advantage to them. Mr. Dawley has now put his experiences on that investigation to account by writing a book with the rather significant, and yet unique title of "The Child That Toileth Not." It is only with the knowledge that Mr. Dawley's particular assignment on the Woman and Child Labor investigation, was to study the condition of the very poor who are attracted to the mills by the offer of employment that the significance of the title becomes apparent, for Mr. Dawley was sent into the rural districts to make his investigation whence the poor families are attracted to the mills and where it is represented the children have plenty of play, outdoor exercise, and go to school and never have to work at all.

Mr. Dawley treats his subject in the form of a narrative, taking his reader with him to his first cotton mill where conditions of child labor were represented as being particularly bad, and where the mill managers would in all probability hide the children employed in the mill ,or send them home on the appearance of the investigator. He had been told all about the anemic little children working in the mills, and yet at Asheville where he was sent to commence his investigations, he was surprised to learn that some of those who condemned child labor in the mills the most, did not seem to know that Asheville had a cotton mill of its own, while others frankly admitted that what they knew about child labor was what they had read or what some one had told them. His next surprise came while standing on the brow of the hill overlooking the factory district, that presented a disagreeable contrast to the handsome city behind him, the dingy old mill with its soot covered chimneys, dull drab houses scattered over the hillside, and the occasional solvenly figure of an untidy woman or slouching man not forming altogether a happy picture, a group of small boys approaching him. They were sickly looking presenting that anemic, or cotton mill type of which he had heard so much, and one of them who said he had "rheumatiz" was walking with a cane.

"Indeed, I pitied the little fellows from the bottom of my heart, "says Mr. Dawley. "It seemed a downright shame that such children so young and small should be allowed to work," and then to his inquiry how long they had been working, the spokesman for the group exclaimed quizically,

"Working!"

"Yes, how long have you been working in the cotton mill?" asked Mr. Dawley.

There was an evident air of disgust as the urchin replied, "We hain't never worked in no cotton mill."

Then Mr. Dawley gets into the mill without the management being made aware of his presence at all, and there he learns for the first time that the boys who are employed in the mill, and who are represented as toiling eleven hours a day, have absolutely nothing to do two thirds of the time, and are allowed to play. With reference to the spinning he says:

"We walked along to the spinning frames. I looked closely for the flying spindles and baby toilers marching back and forward, mending the broken threads.' As I looked down row upon row of these spindles I sought the little toilers represented as working beyond their strength. I saw two very small girls, with wan, pinched looks, such as I was led to believe existed in the cotton mills generally, but these two did not seem to be hurting themselves with work any more than the others."

With reference to the children's ages he says, "As we passed on to the carding machines where male adults only were employed I ran across the little fellow whom I had first seen with the big broom. He still had the broom and seemed to be very happy. He was evidently the youngest boy I had seen, and bending down to him, I asked him his age. Looking up quickly with a grin, he replied, 'I's ten years old,' and then, his grin changing to a more serious expression, he exclaimed, 'No! I's 'levun! Twelve, I mean! No, fourteen! And then in evident confusion he fled down the aisle, taking his broom with him like the stick a small boy sometimes rides for his hobby horse. He had evidently mistaken me for no friend of his, and he had shown his willingness to prevaricate in order to hold his job, a job that was just as dear to him as mine was to me."

The key note of Mr. Dawley's book is sounded upon his leaving the mill, where he says, "if that was a fair specimen of a cotton mill and child labor therein, then somebody had lied, and lied most persistently. Looking up, I saw a ragged group of boys running along the railroad track. It was a cold, brisk November day, and they were bare-footed and bare legged, and thinly clad. Running along to a little yellow tool-house, bright in the sunlight, they backed up against it to enjoy the sun's warm rays. One, puffing vigorously at the stump of a cigarette, passed it on to the next to take his turn at it. These boys were neither employed or going to school. The information I had imbibed was that the employment of the child deprived him of an education, yet here was a vivid example of the education the unemployed child was getting. Was this loafing along a railroad track smoking the stump of a cigarette 'child conservation?' They toiled not, neither did they spin, and they certainly were having plenty of fresh air."

Mr. Dawley's study is from the viewpoint of the people themselves, and not that of the reformist, the professional social worker or sociologist and philanthropist. While he admits that he was somewhat skeptical regarding the many representations respecting factory employment,

*"The Child That Toileth Not," by Major Thomas R. Dawley, Jr. The Grace Publishing Co., 115 Nassau St., New York. Price $2.00.

if for no other reason than workers were represented, not as human beings, but as mere animals devoid of reason, and employers as brutal task masters, a disgrace to our civilization, and fit only to be in jail, while the parents of the children that worked were scarcely better than cannibals. "I had too much faith in human nature to believe all this," he says, "yet it seemed that where there was so much emphatic condemnation there must be some foundation for it, and although the presentation of some of the facts might

FIG. 1. HOME OF A YOUNG MARRIED COUPLE IN THE MOUNTAINS.

be faulty, it was my duty to get all the facts, with the elimination of none."

"I was aware of the inutility of seeking much information from the mill officials," he continues, "for not only were they looked upon as pirates, but I was cautioned against it by the Bureau officials, by my chief in the field, and I may add that on my own part it was only natural to suppose that if the mill men were responsible for the deplorable conditions said to exist, they would avail themselves of such means as lay within their power to hide them or to defend themselves." And so in pursuing his investigation, he first seeks out those who condemned the conditions most in order to learn from them the condition said to exist, with the result he finds that their information is based upon what they have read or what some one has told them, or it is a mere matter of opinion. Accompanied by a professional charity worker who complains of the starvation wages paid the mill operatives, he makes a particular study of poverty in the mill village with the result that of the three cases of poverty pointed out by the charity worker, one is not a mill family at all, and the other two prove to be destitute families recently arrived from rural districts whose poverty is in no way due to the mill. From the families themselves he is unable to obtain any complaint respecting the rate of wages paid, but on the contrary finds that their testimony is unanamous

FIG. 2. A HOME OWNED AND PAID FOR BY A MILL OPERATIVE AT PIEDMONT, ALA.

on the point that they are much better off at the mill than they were on the farms whence they came, and with respect to wages, younger members of the families between the ages of twelve and sixteen are paid for the light work required of them in the mill fully as much as adults are paid for much more laborious work on the farms. Nor was he able to find a single boy or girl employed in the mill who wanted to return to the farm, and when asked for their reason the reply was to the effect that life on the farm was so much harder than at the mill.

Undoubtedly the most interesting part of Mr. Dawley's book is his narrative of events in his search in the mountains for the class of people who in the past decade or two have been supplying the Southern cotton mills with labor. His story is a complete refutation of the charges made against him that he found only bad in our Southern mountains, which was the excuse made by the Bureau of Labor for the suppression of his report, for he not only

FIG. 3. WHERE CHILDREN ARE REARED IN ISOLATION. NO ADVANTAGES, INDUSTRIES OR CIVILIZING INFLUENCES.

points out the existence of as fine and worthy class of people in our mountain country as may be found anywhere else, but he shows a profound sympathy for the very poor people who are unable to make a living on their steep mountain sides or in their isolated coves. In order to reach the poorer people it was necessary to travel miles from any railroad, and in many instances miles from the wagon roads and main arteries of travel. Hundreds of miles were covered on horseback, and frequently to reach the families living in their isolated homes at the end of some narrow trail, it was necessary for Mr. Dawley to leave his horse and proceed on foot. Entire districts were finally covered on foot for the reason that it was found to be the most practical way to get in touch with the poor people themselves.

Districts were penetrated in which revenue officers had been ambushed and killed and in which Mr. Dawley was warned to keep out of in some instances, and in other instances advised to go in disguise as a prospector looking for minerals. He penetrated however, the most remote haunts of the moonshiners, made friends with them and even drank their whiskey with them, and volunteered to lend a hand at their illicit whiskey making, all in order to get the information that would show the cause of their condition and lead to the solution of the problem that has confronted certain sections of our country for many years. In one locality the moonshiners took to the woods leaving their common law wives and numerous children while the investigation was carried on, and attempted to scare the investigator away by firing off their guns in the neighboring woods. On another occasion as Mr. Dawley was approaching the cabin of a notoriously bad woman living with her two daughters and one granddaughter, all of whom were notoriously bad, the paramour of one of the women jumped from behind a tree and shot another who had appeared against him as a witness, literally blowing the ball and socket joint off at the shoulder. There was no medical assistance to be had within many miles, and while strange looking mountain men gathered around with their long guns, Mr. Dawley oblivious to their threatening attitude. attended to the wounded man doing what he could for him. A doctor arrived the next day, amputated the man's arm, and the man died.

It is true that the investigation developed conditions among our people, worse if anything, than those believed to exist among the serfs of Russia. Entire districts were covered in which there was scarcely a house worthy the name, and yet a density of population five times that of the average density of population in more advanced communities. Families of eight, ten and twelve persons were found living in miserable board shacks and in cabins without windows, whose sole diet consisted of coarsely ground corn meal and fat pork. The children were in rags, stunted in growth, anemic, and rarely ever washed, among many of the families such things as soap, comb and looking glass being conspicuously absent. Entire districts were found without schools and where there were schools, some of them numbering a school population of nearly a hundred children, the schools were closed because the parents were too poor to send their children, or they did not see "the use of no schools nohow."

FIG. 4. SCHOOL DISMISSAL AT THE PELZER MILLS, PELZER, S. C.

On the other hand Mr. Dawley tells of stopping with the well to do farmer who pointed out some of these conditions to him, at the same time asking what could be done to remedy them. "Some of these very poor people won't work even when the work is offered them," said the farmer, "because they have never been trained to work, and consequently they are no account. Very often a son of one of these 'no account families' will marry the girl in some neighboring family, and then the two will put up a shack or a rude cabin in some isolated spot remote from civilizing influences and there proceed to rear a family, living on the corn they are able to beg or raise." People of this class, Mr. Dawley found to be quite different from the more noted moonshiner, who is an aggressive and more or less ambitious individual with a desire to work and earn something. Notwithstanding the shocking conditions of poverty, and even vice and crime, found in some of the localities visited, Mr. Dawley unhesitatingly declares that he found the people as a rule, most hospitable and kind, and the

poorest of them willing to share their pone of crude corn bread with the hungry stranger. Doors were without locks, or if they were proivded with rocks, they were without keys. While in some localities murders are frequent, burgulary is an almost unheard of crime, and stealing is only occasioned by absolute poverty which sometimes drives the very poor to steal something to eat, a few ears of corn perhaps, or a half wild mountain hog.

While Mr. Dawley was sent out by the Government to study the conditions of these very poor people, chiefly for the avowed purpose of ascertaining the effect of factory employment on those who go to the cotton mills, he believes to have discovered a remedy for these conditions in the very cotton mill itself. About the time Mr. Dawley began

FIG. 5. MOUNTAIN CHILDREN SITTING BY THEIR CABIN IN MADISON COUNTY, N. C.

his investigations, Senator Tillman of South Carolina meeting Mr. Rockefeller on a train passing through the South, asked him what could be done to improve the condition of the poor whites. Mr. Dawley's answer to this question is give them a job, and he finds that the cotton mill is the one industry that gives them the job that they can or will do, for they must be taken from their idle habits and surroundings while young. If they are left in their isolated coves, mountain retreats or among the sand hills and pine woods of the lower counties, until they are set in their ways with generations of idle habits and lack of thrift behind them, nothing can be done for them even in a cotton mill.

He gives a vivid example of what one small mill has done in a remote mountain county having a reputation for lawlessnes throughout the state to the extent that it was called "Bloody Madison," because of its record for "moonshining," fierce mountain fights, and bloody murders. His is a picturesque, historical discription of that county where he was sent to investigate the conditions of child labor in its one little mill where the condition surrounding the children employed were suspected of being particularly bad. "The cotton mill itself was a very small affair," he says, "and from a manufacturer's stand-point it was hardly worth considering as representative of the great textile industry in the South, but from the stand-point where I was instructed to study it—its effect upon the employed and the community at large—it presented a most convincing example of what such an industry, however small, may do. As already indicated, the county was known throughout the State, and even beyond, for its lawlessness and its crimes. One of its lawyers declared that he had defended 52 homicide cases in the county court house, and another lawyer, now a member of Congress, told me that he had defended so many, he could not remember them all."

"Now let us see what the cotton mill has done for 'Bloody Madison' within four years since its establishment. Before its wheels began going around the population of the county seat was three hundred and thirty seven. Within six months after the establishment of the cotton mill the population had more than doubled. That means that fully three hundred and thirty-seven individuals had been drawn to the mill from the surrounding country, lured by the inducement of work that promised them a regular stipend. They came in groups or families, some member of which was assured employment. Thirty-eight per cent. of the total number of these groups or families found employment as wage earners in the cotton mill ,and fully eighty per cent of these wage earners were women and children." And then Mr. Dawley makes the bold statement that the employment of these women and children had done more for those poor families attracted to the mill from their isolated coves than all the churches and school houses combined. He backs up his statement by showing the material decrease in the number of women and children employed as the people themselves progress. Four years after the establishment of the mill the percentage of women and children employed having decreased to sixty per cent and three years later, according to the report of the State Commissioner, they

FIG. 6. THE THIRD GENERATION AT THE PIEDMONT MILLS, PIEDMONT, S. C.

have decreased to 47 per cent. He points out how the little straggling mountain village whose only industry was the hunting of moonshiners, alleged murderers and lawless men, capturing them, jailing them and trying them, had grown and progressed by means of its one manufacturing industry until it now possesses a court house equal to any in the State, and a modern brick jail without any prisoners to put into it. "The cotton mill," he says, "was conceived in the brain of one of the lawyers, who observing family after family leaving their native mountains for the Southern cotton mills, instead of wasting his time deplor-

FIG. 7. THE GROUP ON THE LEFT IS A FAMILY TAKEN AT THEIR HOUSE AT A COTTON MILL. AT THE RIGHT IS SEEN THE SAME CHILDREN ON THE FARM AFTER BEING LEGISLATED OUT OF A JOB.

ing child labor, and reciting panegyrics on education, he said in a very matter of fact way: 'We need a cotton mill right here. The reason our people are leaving the mountains is they want work, and they are going where they can get it.'"

The county seat at that time did not have even a public school, but four years after the establishment of the mill it was not only able to build a new sixty-thousand dollar court house, and a new brick jail, but it was able to buy the educational plant of the Presbyterian Board of Home Missions, and establish a public school in which the children could be instructed free of charge. Mr. Dawley found that the much abused cotton mill was paying an annual tax of $517.76 of which $118.48 went for the support of the public school, and that while other county seats that had no industries were unable to raise a cent for public improvements, the county having the one small cotton mill was able to borrow all the money required from outside investors upon the strength of its financial showing.

With reference to schooling he says, "one of the greatest cries raised against child labor in the cotton mills is that it deprives the child of an education. Admitting that forceful inquiry, what better education can be given the poor child than one best fitting him for his career in life. I may say that I found children going to school who never would have seen the inside of a school house had it not been for the cotton mill. The cotton mill had drawn these children from their isolated localities where school facilities were not within their reach at all, and while the cotton mill gave some of the elder ones employment, it gave the younger ones an opportunity to go to school." And not only that, but Mr. Dawley found families who had placed their young children in the mill to work at its commencement, and at the end of four years they had homes paid for; fathers were earning good wages, and the children who had begun as wage-earners, were taken out of the mill and sent to school. In concluding his chapter on this one mill he says, "If I were a Carnegie or a Rockefeller seeking to improve the conditions of our poor mountain people, I would build them a cotton mill. I would gather their children in just as soon as they were big enough to doff and to spin, and instead of feeding them on homilies and panegyrics, I would pay them a stipend that would buy them more than 'bread and meat.' I would teach them with real money what money brings, and while my cotton mill might not pay dividends in dollars and cents, it would at least turn out workers capable of making a living for themselves when grown."

FIG. 8. AIR AND SUNSHINE APLENTY FOR THE CHILDREN AT THE FARM HOME ON THE LEFT. ON THE RIGHT IS SEEN THE FLOAT OF THE PROXIMITY MILL KINDERGARTEN IN THE EDUCATIONAL PARADE AT GREENSBORO, N. C. NEITHER DO THESE MILL CHILDREN SEEM PARTICULARLY ANEMIC. WHICH CONDITION WOULD YOU PREFER FOR YOUR CHILD?

After a study of conditions in some of the mountain districts, a vivid example is given of the operation of the child labor law in Tennessee where the child is prohibited working until he is fourteen years of age. Arriving in Knoxville on a late train, Mr. Dawley finds himself facing an extemporized midway aglow with electric lights, flaring torches and illuminated tents, where he is accosted by a ragged, bare-footed, bare-legged and bare-armed little urchin extending his hand pleadingly for help. He is asked why he is thus begging, and replies, "Movver can't git 'nuff work t' feed all on us, an' so I has ter beg." Other questions bring out his story, and he tells how his mother washes and scrubs "'round fur folks," but she can not make enough to feed all her children, and so the eldest one, the little bare footed urchin "goin' on d'irteen" is sent out to beg, and he explains further, "I had a good job down in der cotton mill, an' movver and we young uns was a gittin' along all right when der boss comes and says dey had raised de age what a kid could work at, an' dey put me out, so now I has ter beg."

Says Mr. Dawley, "I know not how to express my feelings as I stood looking down at this child here in this street ablaze with lights and lust and licentiousness, a vivid and unexpected example of the effect of the law that said, Thou shalt not work! I thought of his home, his mother, and his brothers and sisters for whom he had to go out into the street and beg, and the good job he had when he could go home early and sleep peacefully, and in the morning go to his kindergarten job earning the little money necessary to help keep his brothers and sisters in food and clothing. I could see him as I had seen the doffer boys in the mills gleefully kicking their bobbin-boxes down the aisles, or the little fellow whom I first saw at Asheville tumbling over his big broom, and who felt called upon to lie to me about his age because he prized his job more than he did the truth."

Another picture is given of a family of children who have been similarly legislated out of the mill back to the so called farm where by the merest accident Mr. Dawley discovers them in a rude board shack in a notoriously lawless district. His attention is attracted to them by their running out into the road to greet him whereas other groups of children passed, invariably ran away. He discovers that while the elder girl can not read and write very well, two younger girls can, and upon inquiring the reason for this, he is informed that the family was at a cotton mill where the two little girls went to school. Four of the children had obtained work in the mill where their earnings were sufficient to cloth them and feed them well, and then "they made the law depriving them of their jobs and they had to go back to their mountain home of ignorance, vice and poverty," and "can't you do something to have that law changed so we can go back to the mill," was their final appeal.

While Mr. Dawley was repeatedly urged to find the worst mill conditions, and did study conditions at a very small mill in North Carolina, where wages were found to be extremely low, he was unable to secure any complaint from the people themselves respecting those wages. The fathers of the families were mostly all farmers producing enough on their lands, whether rented or owned, to maintain their families, while the earnings of the younger members were looked upon as nearly clear gain. "You can say what you like an' cypher as much as you please," said one of the mothers who had been at some of the larger mills, "but we can save more money at this little ole mill than at any of the other mills we have been to."

Two remarkable chapters are presented in what he calls "Pelzer and its Despotism," and "The Story of the Piedmont Mills." Mr. Dawley was ordered to both of these mills to assist one of the agents in a study of "Welfare Work at the Mills," and the significant fact is pointed out that while the agent employed on this work devoted weeks of her time to it, her report has never appeared. In a frank, breazy manner, Mr. Dawley relates how Pelzer was represented to him as being ruled by a despot at the head of the corporation that owned all the land, the houses and the very souls of the people, yet upon the appearance of an agitator who attempted to point out the wrongs these people were suffering under their yoke of thraldom, they practically rose of their own accord and ran the agitator out of the place. Instead of finding the children working in the mill as represented, of 567 children under the legal working age, 550 were in school, while the little ones too-small for school work, were in kindergarten classes. And then Mr. Dawley confesses that, no doubt 25 years ago, when the mills were first established and the families were drawn from their poverty in the rural districts, many of the children were trained at a very tender age to work in the mill, and he points out the general conditions of the country then and now—the improved homes the improved farms and the improved conditions of the people generally.

His Story of the "Piedmont Mills" begins with the conditions in the "Dark Corner" where they made moonshine whiskey, fought and killed each other, and the only industry at the county seat was the prosecution of these poor, benighted, lawless people. Then the cotton mill, the first of many goes up in that county, and the lawless fathers with their children are drawn from that "Dark Corner" to the mill where the children trained to work become good citizens capable of making an honest living. They become mill bosses, superintendents, and even mill presidents and secretaries, while others having the land hunger instinct of the Saxon return to the farms with their savings and become real farmers. The chapter concludes with actual figures that can not be refuted showing how the cotton mill has not only improved the condition of the people, but has doubled and quadrupled the value of the farm lands, and finally the "Dark Corner" itself, where the stranger once feared to tread, is no longer dark.

As a whole Mr. Dawley's book is a most remarkable work, and one that will be widely read. Those people really interested in child labor conditions will find therein much food for thought, while the social reformers of the Pullman car, automobile, palatial hotel type may be counted upon to send forth a storm of invective against the book and its author.

A report from an American consulate states that a commission agent in a part of a European country where the manufacture of textile goods is flourishing would like to hear from manufacturers of textile machinery and supplies who desire a representative for the district. He would also consider an agency for any textile goods that have a prospect of success. For further information apply to the Bureau of Manufacturers, Washington, D. C., and refer to file No. 8910.

No one is a failure who is willing to try again.

Mill Conditions and Market Reviews.

SOUTHERN MILL SITUATION.

(*Special Correspondence.*)

The effect of a peculiar cotton market during the past month has been felt in the cloth and yarn markets, and the situation now is not as good as it would have been had the price of cotton remained at even a high level, instead of having fluctuated a week after the Government report of condition. The report was issued showing the crop conditions up to July 25 as 76.5 per cent of normal, as compared with 80.6 per cent as a ten-year average. This at once strengthened the markets showing a very decided deterioration in the condition of the crop, and giving the cotton market a bullish nature. Especially was the effect felt in the yarn markets where the prices went stronger, buyers began to listen to prices where in the past they had refused to consider spinners askings, and contracts were being placed at good prices. With the first signs of weakening in the cotton market, which came shortly after with a slump in the prices, the buyers became wary and refused the place any future contracts believing that the price of cotton would fall even more. Spinners have refused to make any price concessions and are holding out for the prices that have been named, stating that they have had to pay high prices for cotton and will not sell at a loss. Some large contracts will be placed soon, and the market is now assuming a natural condition.

The cloth market has not been as active a factor as was expected at the first of the month, but a fair amount of orders have been placed and at fair price levels. Prices have been strong, manufacturers have held for their quotations, and buyers have had to come to them. The commission men are confident that no lower levels will be experienced in this market for some time to come than now, and are urging that trading be done before any higher prices are named. While the volume of goods has not been as great as expected, the cloth market for August has been very satisfactory as regards prices, and the requirements will have to be filled later when the price levels may be higher than they now are.

Knitting mills continued so long on the production of light weight goods for the spring and summer demand that they are now having trouble filling their orders for fall. The knitters have been worried over the price of the raw staple, and the buying has been slow. Spinners have marked up their prices, and the indications are that prices generally will be higher. Buyers and agents are also worried over the present levels as knitters are refusing to take orders at the prices they are naming. Prices are going up however, and the trading is firm with indications pointing to improvements in the takings. The season is almost over, but it is expected that some late buyers will place some good orders.

Some interesting figures regarding Southern cotton mills have been compiled showing that the Southern mills are now in excellent condition. In the South there are 768 cotton mills with a total capitalization of $209,522,000; total spindleage 12,279,288; total loomage, 256,035; of these there are now standing idle for various reasons, 31 mills containing 209,935 spindles and 4,361 looms. In number of spindles South Carolina ranks first with 4,397,980 spindles; North Carolina second with 3,556,723; Georgia third with 2,102,672 spindles; and Alabama fourth with 1,005,686 spindles.

Regarding mill building in the South, it is estimated that there are now orders on the books of various cotton mill machinery shops, for over 70,000 spindles, which when installed will represent $15,000,000. This does not include the large amounts of machinery which has already been installed this year, or orders for replacing old machinery, some single orders of which amount to 16,000 spindles. Only a small proportion of these additions are for new mills, most of the spindles being added to the present equipment of mills that have been in operation for some time.

A review of the additions and charges that have taken place in the Southern mills during the past month will be of interest.

New Mills: The Prendergast Cotton Mills have been incorporated at Prendergast, Tenn., at $100,000, and will be equipped with 10,000 spindles. It is reported that J. W. Cannon, president of a number of mills in North Carolina, will build another mill at Kannapolis, N. C., as an additional plant of the Cabarrus Co. of Concord. Crown Cotton Mills, Dalton, Ga., will build a new mill at Phelps, just outside the city; no particulars have been published. Rosemary Mfg. Co., Roanoke Rapids, N. C., have definitely decided to build a new mill. Crystal Springs Bleachery Co., Chickamauga, Ga., will build a cotton mill which will probably contain 20,000 spindles and 800 looms. Capital at Trinity N. C., has formed the High Point Consolidated Mill Co., for purposes of building a mill. Lancaster (N. C.) Cotton Mills have let contract for new mill 900x237 feet; to contain 50,000 spindles and 1,500 looms.

Reorganizations of Old Mills: The Mercia Yarn Mills of Crouse, N. C. are now under new management and are known as the Strant Yarn Mills; Albany Mfg. Co., has been chartered at $110,000 to take over the old Albany Cotton Mills, Albany, Ga.; Waukeska Mills, Cedartown, Ga., chartered at $25,000 to take over the Cherokee Knitting Mills; Royal Mills, will take over and operate the old Royal Bag and Yorn Mills at Charleston, S. C., with a capital stock of $250,000; the Trion Co., has been organized to operate the Trion Mfg. Co., of Trion, Ga., the new company has an authorized capital of $900,000 with $20,000 paid in.

Additions and Improvements: Wadesboro (N. C.) Cotton Mills, will replace 2000 old for new spindles. Paulding County Cotton Mfg. Co., Dallas, Ga., have added 5,000 spindles at a cost of $75,000. High Shoals (N. C.) Mills Co., have changed 123 old for new looms. Franklin Mills, Concord, N. C., are building 100 foot addition to plant. Durham Hosiery Mills Co., have placed contract for the new addition at High Point, N. C. Brandon Mills, Greenville, S. C., have increased capitalization from $1,000,000 to $1,500,000. Mary-Leila Mills, Greensboro, Ga., have added a new engine to power equipment. Smitherman Mills, Troy, N. C., have installed humidifiers. Francis Mills, Biscoe, N. C., have installed humidifiers. Pickens (S.

C.) Mills have added 6,000 spindles, 160 looms, and a 105x86 foot brick addition to plant. Cliffside Mills, Cliffside, N. C., have added humidifiers. Sibley Mfg. Co., Augusta, Ga., have added 150 looms and humidifiers. Gaudalupe Cotton Mill, Cuero, Tex., is making additions. Victoria Mills, Rock Hill, S. C., have built a new warehouse. Riverside Mills, Augusta, Ga., have definitely decided on a $17,000 addition. Trenton Mills, Gastonia, N. C., have added humidifiers. Deep River Mills Co., Randleman, N. C., have purchased new power equipment. Neuse (N. C.) River Mills have installed 40 new looms. Bellevue Mills, Hillsboro, N. C., have increased capitalization from $125,000 to $250,000. Riverside and Dan River Mills, Danville, Va., have placed contract for building the new mill that has been announced as planned by that company. Marlboro Mills, McColl, S. C., have installed 26 looms for making automobile tire cloth. Ridgedale (Tenn.) Processing Co., has announced erection of 176x84 foot building. Toxaway Mills, Anderson, S. C., will add 263x105 foot three-story addition to mill, and also a new warehouse. Columbus (Ga.) Mfg. Co., will add 200x150 foot cloth room, and has placed contract for 15,000 spindles and complementary machinery. St. Louis (Mo.) Cordage Co., will add a new building and additional machinery.

The Whitaker Mills, Blacksburg, S. C., will be sold on Sept. 3rd by the receiver. Senoia (Ga.) Duck Mills will be foreclosed by mortgage. The Clover (S. C.) Mills were almost totally destroyed by tornado on the 3rd, but will be rebuilt at once.

NEW ENGLAND MILL SITUATION.

(Special Correspondence.)

The twelve New Bedford corporations whose mills were closed July 15, through a strike against the system of grading weavers' payments, ramained closed all the month. Efforts at compromise were not very urgent. A strike was inaugurated at the Berkshire mills at Adams, Mass., by the I. W. W., the alleged grievance being the refusal on the part of the authorities to discharge four weavers who declined to become members of a union. All of the mills closed at New Bedford and Adams are engaged in fine combed yarn cloth production and as the market for the goods is suffering from the effects of overproduction, following the rapid building of fine yarn mills, the strikes have aided in restoring some part of the balance between demand and supply.

It is expected at this time that efforts will be made to resume operations in the mills after Labor Day, but at this writing there is no certainty that the operatives will return. A special grievance with loom-fixers in the Dartmouth mills, New Bewford, was adjusted at a conference of the union representatives, and Walter H. Langshaw, the treasurer. A protracted difficulty with the loom-fixers in Fall River was adjusted through an agreement on the part of the Manufacturers' association to grant a wage increase to loom-fixers varying with conditions existing in each mill, and averaging about 10 per cent. A further effort is being made by some mills to standardize the size of sections loom-fixers will be called on to attend for a specific wage. Aside from these labor troubles there are still many minor difficulties reported. Fall River has about 12,000 looms idle on account of a shortage of operatives and about all the mills in the section complain of either help shortage or a dearth of skillful operatives. The mills in the northern section of New England that usually grant a two week's vacation followed the practice this year while many orders on the books are undelivered. The power for mischief of the I. W. W., appears to be waning in this district.

Trade was fair with the mills in the early part of the month. Toward the last half of the month, however, the demand fell off and sales of print cloths fell in one week to less than 80,000 pieces at Fall River. Prices sagged off from a basis of 5⅜ cents for 38½ inch 64 x 64s to 5⅛ cents. The mills are comfortably supplied with orders for September, on print cloths, and some mills have orders on their books for the balance of the year. Prints were advanced to a basis of 5½ cents for American standards and trade since then has been light. The Algonquin Printing Company at Fall River closed down for two weeks.

Business on fine printed goods has been very quiet, especially on the plain batistes, lawns, organdies, etc. The spring orders should normally be due at this period but buyers are indifferent. Fancy prints, such as voiles, crepes, plisses, etc., are in fair demand and such works as the Arnold are busy on specialties.

Mills making blankets, canton flannels, napped fancies, etc., are very busy on old orders, the season having been especially long and good. The fancy cotton blanket mills like the Esmond, Nashua, and Beacon, have all the business they can handle for the balance of the year. Canton flannels of the better grades are in very light stock and the demand is in excess of the ability of mills to meet it. Wide flannellettes for the cutting trade have been in steady call and some cutters are forced to use the narrow goods.

Business with the gingham mills is fair but not active. Staples are very well sold and there is a steady demand for chambrays for shirting and manufacturing purposes. Seersuckers, both striped and crinkled are well under order. The dress gingham situation has improved during the month and when the new season opens next month it is believed that orders on the lower grades will come along very freely. New patterns are running to decorated styles and small neat effects, rather than to the large plaids and plain fabrics of last season.

Bleached cottons are in a firm position. Fruit of the Loom goods were advanced to a basis of 8⅝ cents during the month and are held at value. Most of the business done recently has been on the lower counts such as Hopes, Heros, etc., and looms set apart for these cloths are engaged for some time to come. There is every expectation now that prices will hold throughout the balance of the jobbing season. Longcloths, nainsooks, and the fine, closely woven plain cloths, are selling better than lawns, linons, or batistes. Stocks of goods from 60s warps and over have been reduced materially by the shut down at New Bedford and Adams.

Pepperell drills for India have been sold up to November and the agents refuse to go farther ahead until the cotton outlook is clearer. The break in cotton is blamed for the quiet that has come in the markets during the past two weeks, but selling agents also attribute some part of the hesitation to the natural desire of mills and buyers to await the final cotton reports that come along at the end of August and first of September. Manufacturers are not looking for as low priced cotton as they had last fall. They would welcome it of course, but the difficulty that has been encountered in breaking through the 11 cent mark, together

with the sustained values in other textile raw material leads them to anticipate a power in the South to hold its staple at a pretty fair level even though the early marketing of the crop may be somewhat slower than last year.

Manufacturers expect that consumption of cotton will be larger in 1912-13 than in the current season as the mills are now generally at work all over the country, and have orders in hand to keep them busy for two or three months to come. It was some time after September 1 of last year before the mills as a whole began running in any large way and it was not until the early activity of this year that mill managers would concede that the cotton mill depression was over for a time.

Quilt mills have been busy all summer and the three largest ones in New England have all the business they can handle until December. Salesmen will go out shortly in search of spring orders and the manner in which deliveries on orders are being anticipated where they can be, insures a good prospect for steady spring sales. Towelling looms are very well engaged and most of the heavier looms have had a busier year than for five years past.

Staple tickings are well sold ahead into October. Denims are not so well sold although some of the leading brands are scarce and there can be no surplus stock this year. Awning stripes and fancy duck are in an excellent position, while cheviots, and working suit specialty mills have all the orders they can handle before December.

The one weak spot in New England mill conditions is that in fine goods. The high priced novelties shown for spring have sold very well indeed, and it is the opinion of selling agents that more high priced dress cottons have been bought for spring delivery than ever before. The dearth in business on plain fine goods and goods of a staple character continues, so that the strike is not at all a serious market factor for the moment. If the trouble is to be prolonged it will disorganize the plans of converters and merchants who have at least a million and a quarter pieces of fancy goods on order with the mills that are shut down.

The principal business that is being done in dress cottons is on voiles, poplins, fancy piques, crepes, and cords. Many varieties of silk striped goods are being offered some of them selling as high as 50 cents a yard. One cloth, an imitation charmeuse, is offered in the market at 72½ cents and has been sold beyond the capacity of the few looms assigned to it. The closing of the large fine goods mills has necessarily affected the finishing plants to some extent and it will be some weeks before plants can be whipped into running shape again.

The mill machinery plants are decidedly busier and all but one is reported as running full time. One or two have a complete working force employed and further business will entail operations in some departments at night. The machinery men complain that prices are low and close but if orders continue to come forward as they have in the past four weeks they have every confidence of a profitable winter's work. Much of the new business is coming from outside of New England.

Mill investments are picking up slowly. The last quarterly divided list issued at Fall River showed a gain in dividends paid over that of the previous quarter and shares are held firmer and higher. The New Bedford strike has made very little change in mill share values as fully half the mills that are closed can remain so for some time without impairing surplus accounts.

COTTON CROP CONDITIONS AND A REVIEW OF THE MARKET.

(*Contributed Exclusively to* COTTON.)

BY H. AND B. BEER, NEW ORLEANS.

During the past month the growing crop made favorable progress in nearly all sections of the belt. Good general rains were had at an opportune time, in the early days of August, in Oklahoma, Arkansas and Texas, removing all fear of a summer drouth in the Southwest. In the Mississippi Valley and South Atlantic states favorable weather was had, and much of the lateness of the crop east of the Mississippi River has been recovered.

At the moment Texas still stands at the head of the good crop states, with Oklahoma crowding her for first place, while Arkansas probably holds third in rank. The most improvement of late, however, has taken place in the central states, such as Louisiana, Mississippi, Alabama and Tennessee, while Georgia and the Carolinas report progress.

Last month we stated that we were of the opinion that the August Bureau report would show a condition of about 76, which would compare with 89.1 last year and the ten year average of 80.6. The Bureau reported the condition of the crop as being 76.5.

To-day we believe that the September Bureau report will make a far better showing compared with one year ago than did last month's Bureau report, as we are of the opinion that the next Bureau report will show a condition of about 72, which would compare with last year's September report of 73.2 and the September ten year average of 73.6.

If such a condition is realized, it will readily be seen that crop prospects to-day are decidedly more favorable than they were one month ago, especially when it is considered that the condition of the crop is nearly, if not actually as good as it was this time one year ago when a crop of 16,100,000 bales was grown. The only thing to reckon with this year being the reported decrease of about 7 per cent in the acreage, which amounts to about 2,500,000 acres. Under the circumstances it would seem that if good weather is had during balance of this season, and if killing frost is late in putting in its appearance, that a crop of about, 15,000,000 bales is within the bounds of possibility, if not probability.

In our review of one month ago we stated, as regards the probable future course of the market after the August 2nd. Bureau report was out of the way, that the chances were that it would be downward. At near the close of July, October contracts in this market sold at 13.34, in the meantime they have sold down to 11.16, closing at this writing at 11.37-38.

We are of the opinion that the market will sell still lower, especially if the September Bureau is anything like in keeping with our expectations, or say around 72, and while erratic markets are to be looked for thereafter, owing to the approach of the storm and frost periods in September and October, it is our conviction that cotton will prove to be a sale on all important reactions from present levels unless killing frost is early in making its appearance, which might tend to cut down present prospects for the growing crop.

There has been disappointment in the absence of an urgent demand for early deliveries of new crop cotton from

Texas, but this was to be expected when it is considered that European mills held about 700,000 bales more cotton than at this time last year, and because the world's visible supply is about another 700,000 larger than one year ago. Therefore, it is not surprising to see foreign spinners buying for immediate wants only, especially when it is realized that the price of cotton last year declined to nearly 8½ cents before the advance set in with the turn of the new year.

Moreover, trade advices from Manchester are distinctly less favorable than they were last year, for while there is certainly some trading daily, the large lines with India and China, which England has been accustomed to for some time, are not in evidence now. According to report from Liverpool the heavy decline in raw cotton has caused a great deal of hesitation, and spinners are trying to improve their position by refusing to reduce their quotations in proportion to the decline in the raw material.

THE YARN MARKET.

The yarn market for the past month has to a large extent followed the raw cotton market. When the prices of raw cotton stiffened the yarn market immediately followed and as the raw cotton market sags, the yarn market seems inclined to hold its own, although prices are easing off on some lines. Deliveries on old contracts are good and there seems to be a fair buying for underwear manufacturers. Some are inclined to believe that lower values will prevail and hold off. There seems to be a tendency of combed yarns to decline although some Southern spinners, who are well sold up, keep their prices at very high levels. Big buyers seem to be dropping into a waiting attitude as some are certain that prices will decline. Spinners prices, as a rule, hold higher than market quotations, and while they are not rushed with business, they, as a whole, have enough to keep things going comfortably and do not seem to be worrying. Weavers are very light buyers and seem to be feeling out the market.

Early in the month the Boston market showed advancing prices and some good sized business placed. Very little spot yarns were obtainable and inquiries were being received from practically all classes of consumers covering all kinds and descriptions of yarn. During this period the cotton situation was watched closely and regardless of the size of the crop, the lateness of the crop means probably the middle of October before any new cotton in quantity will be available for spinning.

As the month advanced the Boston yarn market still held strong and there was some business doing all the time, although in comparatively small quantity. The inquiry if anything was slightly better than it was earlier in the month. During this period the raw cotton market slumped to some extent but this did not disturb the spinners in the slightest way. Mills that own their cotton have in most cases paid good prices for a good grade and they continue to hold yarns at figures sufficiently high to cover the cost of production. Quite a number of knitters came into the market for supplies and tried to get spinners to do business below a basis of 19 cents for 10s but most mills were then asking 19½ cents and refused to accept forward business at anything less.

As the month closes it shows little important changes in prices. Uncertainty in the cotton situation is the largest factor at present. The reports of the Boston market indicate that buying is still largely of a hand to mouth character and there has been little improvement in the conditions that characterized the most of the month. There is some decline in yarn quotations for future delivery owing to the decline in the price of cotton, but spot sales are holding very steady. In the New York market spinners remain as firm as ever and refuse to shade prices. It is reported that dealers are not carrying much surplus.

The New York quotations at the end of the month were as follows

SOUTHERN SINGLE SKEINS.

4s to 8s	17 @18	22s	22 @22½
10s to 12s	17½@19	24s	23 @--
14s	19 @--	26s	24 @--
16s	19½@20	30s	26 @--
20s	21½@22	40s	35 @--

SOUTHERN TWO-PLY SKEINS.

4s to 8s	18 @19½	36s	34½@35
10s to 12s	18½@19	40s	36½@--
14s	19 @19½	50s	44 @--
16s	@19½	60s	49 @50
20s	21½@22	3-ply 8s upholstery	18½@--
24s	24 @25	4-ply 8s upholstery	18½@--
26s	24½@--		
30s	26 @--		

SOUTHERN SINGLE CHAIN WARPS.

10s to 12s	19 @--	24s	23 @--
14s	19½@--	26s	24 @--
16s	20 @--	30s	26 @--
20s	21½@22	40s	36 @--
22s	22 @--		

SOUTHERN TWO-PLY CHAIN WARPS.

8s to 10s	19 @19½	26s	25 @25½
12s to 14s	20 @20½	30s	26 @--
16s	22 @--	40s	37 @--
20s	22½@22	50s	45 @--

SOUTHERN PEELER FRAME CONES.

8s	19 @--	18s	21½@22
10s	19½@--	20s	22 @--
11s	19¾@--	22s	22½@--
12s	19¾@--	24s	23 @--
14s	@20¼--	26s	23½@--
16s	21 @--	30s	24--

THE KNIT GOODS MARKET.

The knit goods market for the past month has in a large measure fulfilled the expectations prophesied for it during the month previous. The action of the raw cotton market during the part of the month following the bureau report from Washington was reflected in the yarn market and stiffened prices to the point where a large majority of knit goods people did their best to hold out as long as possible without buying. Later in the month, however, again following the raw cotton market, the yarn market dropped off a few points and manufacturers of light weight underwear were quite avid buyers. However, many of the large buyers for underwear concerns are still holding out for their yarn contracts.

The month opened with a very satisfactory outlook in the underwear market. Prices on all descriptions of underwear were very firm and advances were made in quite a considerable number. Quite a large number of buyers were in the market at this time. Business in hosiery was also good and reported by many to be in every respect much better than it was a year ago. Prices generally show an upward tendency. Demand for white goods in hosiery still continues a feature of the market and are being bought in half hose as well as in the ladies and children's styles.

The outlook for underwear at the middle of the month continued most encouraging with steady calls for prompt deliveries. Some advances had been asked and obtained as the result of the increased demand and buyers

were taking spot goods at fair prices. Continued interest in union suits was shown and stocks of these suits were reported to be small. The call for sweaters for prompt shipment was also of fairly large proportion and will probably increase a little later in the season. Hosiery also remained under good demand with mercerized goods taking well and the mills manufacturing these goods receiving many orders, although the stiff yarn market was a hindrance to some extent. The statistical position of the market at this time was unusually strong and knitters had considerable difficulty in satisfying buyers in regard to deliveries.

As the month closes, it finds the underwear market very firm and underwear sellers expecting a heavy fall business. The sweater situation seems to be unusually strong and prices have taken several jumps. Many mills have increased their capacity in their endeavor to supply the requirements. Novelties continue to be in favor with the blazer, mackinaw and norfolk leading. The hosiery market still shows much strength, although the trade is quiet. Mills are very busy on orders already booked and there seems to be a good call for children's stockings. Initial buying of spring goods has about closed up and the future course of the market will be determined largely by the price of new cotton. Inasmuch as this crop now seems to indicate approximately 14,000,000 bales, it is probable that the raw cotton situation will ease off somewhat in a short time. Everything considered the mills have transacted splendid business in both hosiery and underwear this year.

COTTON MANUFACTURING.

RING FRAME BUILDERS.

(*Contributed Exclusively to* COTTON.)

BY H. C. W.

The mechanism which builds or forms the bobbin on the ring spinning frame is called the builder, or builder motion. They are made in three styles known as the warp builder, the filling builder, and the combination builder. The warp builder is used for building what are known as warp bobbins, the filling builders for building filling bobbins, and the combination builder, by changing cams and other minor adjustments, may be used to build either a warp or filling bobbin.

The methods of forming, or building up, the warp and filling bobbins are entirely different. Different formed cams are used in each case and different methods used to control the rise and fall of the ring rail.

Fig. 1 shows the graphic method of building the warp bobbin and we will proceed to take up this style of builder before explaining the other two styles. In Fig 1 AB represents a lever pivoted at A. At D suitable motion is given this lever which causes it to swing up and down through an arc. By suitable connections, we will suppose the outer end

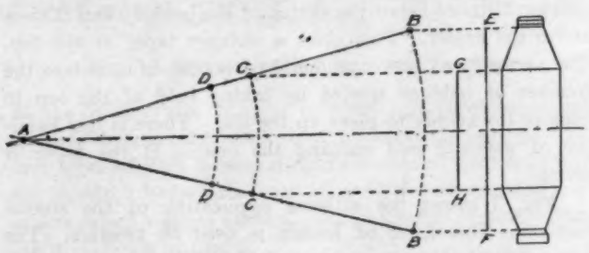


FIG. 1. THE GRAPHIC METHOD OF BUILDING THE WARP BOBBIN.

of this lever is to guide the yarn onto the bobbin. It can be seen from the diagram therefore that the length of traverse on the bobbin with the length of the lever equal to AB will be represented by EF. As the bobbin fills, suppose the length of the lever is gradually shortened until, when the bobbin is full, the length of the lever is equal to AC. In other words B has moved in to the point C.

While this shortening has been going on the lever has had the same throw at the point D. The result is that the traverse is gradually shortened until, at the time when the length of lever is AC, the length of traverse on the bobbin is equal to GH. This continual shortening of the lever with a corresponding reduction in the length of traverse builds a bobbin which has a taper at both ends as shown at Fig. 1. It must be remembered that in the case shown at Fig. 1, the builder arm swings the same distance above the center line that it swings below the center line. This builds tapers of equal amounts at each end. If it swings a greater amount above than below it will make a longer taper at the top than at the base. If it swings a greater distance below than above the opposite effect is noticed.

The practical application of this idea is shown at Fig. 2. X is the builder arm. This arm receives an up and down motion from the heart shaped cam C carried on the cam shaft E. This cam bears against a small roll carried

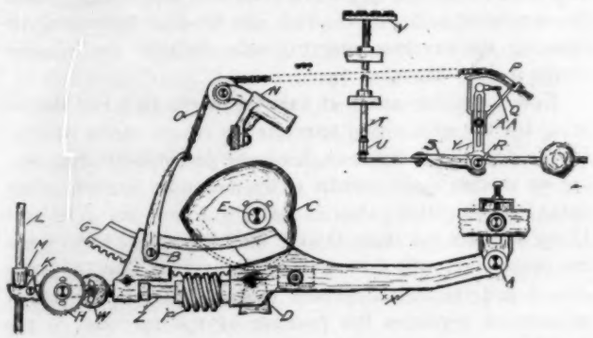


FIG. 2. THE PRACTICAL APPLICATION OF THE BUILDER MOTION.

in the bracket D. After once being adjusted, the position of this roll should not be changed. If it is moved or works loose, it will upset the traverse and the build of the bobbin. The builder arm is pivoted on a short shaft A. At the front of the builder arm, it carries the short shaft Z to which are fastened the double threaded worm F and the pick gear H. Meshing with the worm F, and carried in a suitable slot in the builder arm, is the curved rack G. Fastened to G is the hook B. This hook connects, by means of the chain O, the builder arm with the quadrant Q. This quadrant is fastened to the upright Y which in turn is fast to the cross shaft R. Also fastened to this cross shaft is the arm S carrying a short secondary arm. At the end of this arm is a small roll upon which the step of the ring rail

rod rests. After passing through a pair of bearings the rod supports the ring rail V whose up and down movements guide the yarn onto the bobbin.

The principle on which this motion acts is exactly the same as in Fig. 1. The rod AA at the top of the upright arm Y connects other similar uprights which, by means of similar arms like S, support the ring rail at suitable intervals along the frame. Weights are hung from each cross shaft which overcome the weight of the ring rail and builder arm thus always keeping the small roll in contact with the cam.

The method used to shorten the working arm of the builder is as follows: The pick gear H is fast to the shaft Z which carries the worm F. The rod L is fastened to the framing of the machine and extends through a suitable opening in the pawl K. The rod L carries a small adjustable collar M which, when the builder arm rises, forces the pawl down thus turning the pick gear a slight amount as the arm descends the weight W brings the pawl back to its original position ready for the next rise of the arm. This slight turning of the pick gear turns the worm, which in turn gradually works the curved rack back, thereby shortening the working arm of the builder. The collar M is adjustable and may be set to pick different amounts. The more teeth picked the faster the arm is shortened and the steeper the cones will be at the ends of the bobbin. The fewer the teeth picked the more blunt the taper will be.

The adjustments of the warp builder are made at different places in the motion, some affecting the length of traverse and others affecting the position of the traverse on the bobbin.

In setting or adjusting this type of builder the cam should be turned so that it is on half throw. Then adjust the bracket D so that the small roll comes directly below the center of the cam shaft E. Then adjust the shaft A on which the arm is pivoted so that the arm is level when the cam is at half throw. This can be done by raising or lowering the brackets carrying this shaft in the manner shown in the sketch.

Now when the cam is at half throw the ring rail should bring the top of the ring opposite the center of the bobbin. If this does not bring it so, it can be adjusted by lengthening or shortening the chain O by means of the adjusting nuts P. Shortening the chain will lower the ring rail If we lengthen the chain O at P then the weight hung from the cross shaft will draw the quadrant back and raise the arm S and the rod T thereby raising the ring rail. This adjustment regulates the position of the traverse on the bobbin.

Next turn the camshaft E until the roll is in the heel or low part of the cam. This will allow the builder arm to swing up to its highest point and also allow the ring rail to rise to its highest position. (In making this adjustment be sure the rack G is out as far as possible.) If the ring rail does not rise high enough it means that the quadrant Q is not properly adjusted on the upright arm Y. The nearer the quadrant is drawn towards the center of the cross shaft R, the longer the traverse will be. The farther away it is from the center, the shorter the traverse will be.

The quadrant moves through an arc equal to the rise and fall of the builder arm. We will say for illustration it is 6 inches. Now an arc 6 inches long on a circumference with a diameter of 20 inches is only ½ as great as an arc of 6 inches on a circumference with a 10 inch diameter. Therefore if the quadrant is only 10 inches from the center of the cross shaft it will give twice the rise and fall of S that would be obtained if the quadrant were 20 inches from the cross shaft. Therefore the length of the traverse can be regulated by adjusting the quadrant.

After getting the ring rail at the proper position at the top of the bobbin, turn the cam shaft until the roll is under the toe of the cam. All other things being equal it follows that this should bring the ring rail down to the proper point at the base of the bobbin. Because we set the builder level, with the cam at half throw and the ring rail in the center of the bobbin. Therefore we should get the same length of traverse above the center and below the center of the bobbin. Following out the above directions will give a bobbin having equal tapers at the top and bottom. In actual practice it is customary to make the taper at the top of the bobbin a little sharper than at the base. This can be done in two ways.

The first way it can be done is by moving the guide pulley N out towards the spindles. The curved rack G is formed by using the pulley at N as a center. Now if we should move this pulley off center it would mean that we should shorten and lengthen the radius of the curved rack G which would shorten and lengthen the chain O. In other words if we moved the block pulley N out towards the spindles of the frame, or the reader should consider the pulley to be moved to the left, it would take up a certain amount of chain and not let the rail rise so high when

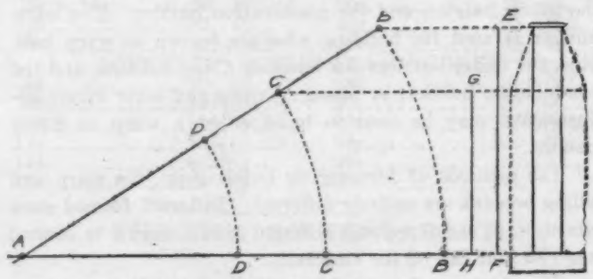


FIG. 3. MAKING A SHARP TAPER AT TOP OF BOBBIN.

the builder arm came up. This would tend to increase the length of the taper at the top.

The second method by which this can be done is by lowering the pivot A. This allows the rail to drop down a greater distance below the center of the bobbin than it rises above the center. This gives a sharper taper at the top. The necessity of this style build of bobbin is to reduce the number of bobbins spoiled by taking hold of the top to remove the bobbin to piece up the end. There is less liability of snarling and spoiling the bobbin if the taper is sharp.

Fig. 3 shows the extreme application of the second method. This form of bobbin is used on twisters. The base of the bobbin is square and in order to fill the bobbin full, it becomes necessary to bring the ring rail down to the same place at the end of each traverse. This builds a bobbin having all the taper at the top and practically none at the base.

When the arm is equal to the length AB then the traverse is equal to EF. When the arm is shortened and equal to AC then the traverse is equal to GH. But it can be seen that as the arm is shortened it still descends to the same horizontal plane each time. This effect is produced by setting the builder arm level when the cam is at its full throw and the ring rail is at its lowest point. A heart cam

and builder as shown in Fig. 2 is used to produce this style of bobbin. It is possible to fill such a bobbin to a size beyond the size of the base. This is done as follows: Raise pivot A a slight amount so that the builder will produce a slight taper at the base of the bobbin. Then lower the traverse a very slight amount so that a few coils will wind up at the base of the bobbin. The result of this combination of adjustments is to produce a bobbin which will round out from the base and allow a larger amount to be put onto it.

Fig. 4 shows a filling bobbin and the method of building it. Unlike the warp or twister bobbin, which are straight, the filling bobbin has a small cone at the base upon which we start to build.

In the case of the warp builder and warp bobbin, we

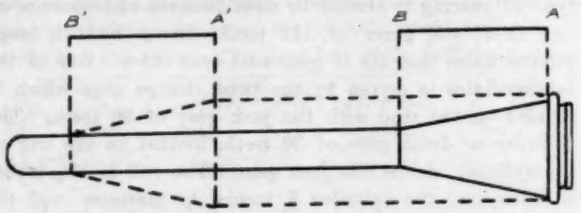


FIG. 4. THE FILLING BOBBIN AND THE METHOD OF BUILDING IT.

decreased the length of the builder arm thereby reducing the *length* of the traverse, but the *position* remained unchanged. That is the rail was raised the same distance above the center of the bobbin that it was dropped below the center.

In building the filling bobbin just the opposite occurs. The *length* of traverse which is comparatively short, remains unchanged, but the *position* of the traverse on the bobbin is gradually raised as the bobbin fills. The length

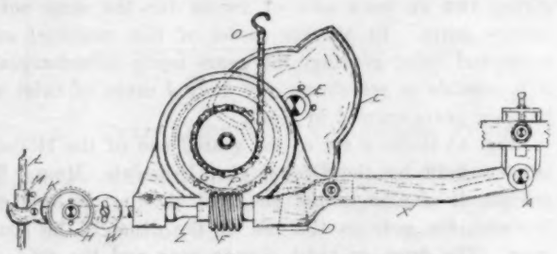


FIG. 5. METHOD OF RAISING THE TRAVERSE.

of the builder arm remains constant. A three lobed cam is used which gives a much shorter traverse to the rail. The first layer of yarn is wound onto the conical shaped base of the bobbin. Before the next layer is wound on, this traverse is raised a slight amount and the method of accomplishing it is shown in Fig. 5.

The builder arm X, pivoted at A, carries a single worm F meshing with a worm G. This gear has a double tooth P which prevents the gear from being wound any farther back than this point and therefore insures the frame starting at the same point after each doff. The worm is turned by the pick gear which in turn is given a slight movement by the collar M acting against the pawl K. The worm gear G has a large, solid hub upon which is wound the chain O. This hooks into a similar chain as shown in Fig. 2 and connects with the quadrant and ring rail in the same manner.

The up and down motion of the builder arm is obtained from the three lobed cam C. This cam has a short quick throw and a long slow throw. This gives the ring rail a short quick traverse and a slow traverse. The purpose of this is to wind on a series of binding coils which helps to make the bobbin firm and hard. It also separates one series of coils from another thereby allowing them to draw off more easily in the weaving process.

As the pick gear is turned, the worm turns the worm gear, thus unwinding the chain. This constant paying out or lengthening of the chain causes the quadrant to swing farther back, thus allowing the ring rail to rise higher. The speed at which the pick gear is turned regulates the speed at which the chain is unwound and therefore the speed at which the ring rail rises.

The speed at which the ring rail rises governs the diameter of the bobbin. If the pawl picks too many teeth the diameter of the filling bobbin will grow smaller and smaller and the taper will gradually grow sharper and sharper. To increase the diameter of the filling bobbin, then, we would pick less teeth.

The builder arm of the filling builder should be set level when the cam is at half throw. This allows the arm to swing equal distances each side the center of the traverse. The position of the traverse can be governed by the adjusting nuts P, Fig. 2. The length of the traverse can be regulated by adjusting the position of the quadrant.

The combination builder is one constructed so that we can wind warp or filling by changing the cams and removing the curved rack and substituting the worm gear. The cam shaft in this case has two cams, a heart cam, and a 3 lobed cam. Some machine builders make a 4 lobed cam. These cams are placed one on each side of the builder and by simply removing the roll from one side and putting it in the bracket D on the other, we change the cams from one kind of a wind to the other. The arm is so constructed that it can accommodate either the curved rack or the worm gear. The short shaft Z carries two worms, a coarse pitch double worm for the curved rack and a finer pitched single worm for the worm gear used in the filling wind.

By removing the curved rack and replacing the worm gear and connecting the chain with the quadrant we are able to build filling bobbins. With each change of this kind the traverse has to be adjusted by the methods explained previously. The combination type of builder is used in yarn mills spinning warp or filling to order. By changing over the builder, they are enabled to convert a warp into a filling frame.

COTTON MILL MACHINERY CALCULATIONS.

(*Contributed Exclusively to* COTTON.)

BY B. M. PARKER.

PART XVIII.

Twisting is the process of combining two or more single threads into one by the simple act of twisting them together. The machine doing this is called a twister, being similar in general construction to the spinning frame. It does no drawing, the rolls being arranged to grip the yarn and feed it forward, at a constant speed, to the spindles, which put the twist in yarn. The machines are built smaller and are run at a higher speed as the counts of the yarn twisted increase. They are also built to do wet or dry twisting, wet twisting, that is, passing the yarn through water just

before it reaches the rolls, being used to give the yarn a smoother finish and less tendency to kink from the twist present. The use of either warp or filling wind is possible.

The yarn, after being twisted, is spoken of as "ply" yarn, the word "ply" signifying that there are more than one individual strand in the yarn. As the ply yarn may contain two, three or more strands in its make-up, it is usual to designate the number of such strands present, as two-ply or three-ply yarn. The most common is the two-ply or doubled yarn.

The counts of ply yarns are given as the counts of the single yarn of which it is composed, with a figure in front indicating the number of threads twisted together. If two single yarns of 40s counts are twisted together the resulting ply yarn would be called two forty's and expressed thus, 2/40s; the figure 2 indicating the number of strands in the completed yarn and 40 the size of the individual yarns. In calculations for the weight of goods, twist and production, we must consider the yarn as being 20s, as 2 strands of 40s yarn is the equivalent in weight of a single 20s. In the same way 3/30s means a 3-ply yarn composed of 3 strands of 30s yarn and is the equivalent of a single 10s yarn.

There is no set or fixed rule for determining the amount of twist to put in twisted yarn, the exact amount depending upon the purpose for which the product is to be used and, as this varies to a very great extent, the twist will vary also. In making two-ply yarns for market, it is usual to twist the single yarns slacker than warp twist and use four as a multiplier for twist in the ply yarn. In filling orders it is usual for the buyer to state the amount of twist desired and the mill puts that amount in the yarn. Yarns for weaving are spun and twisted slacker than warp, if for mercerizing the amount of twist is less than filling. The hardest twisted yarns are those intended for lace work and sewing thread, while the softest twisted yarns are those intended for crochet and embroidery yarns.

The general rule is to spin the yarn with regular or "warp" twist and twist with reverse twist, that is the spindles of the twister will revolve in an opposite direction

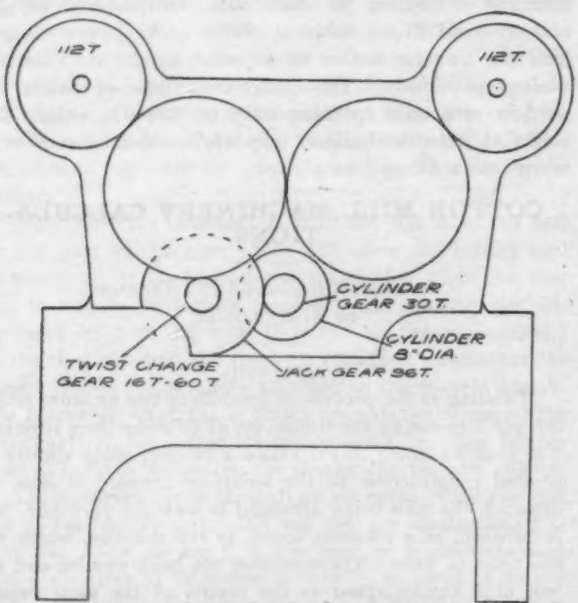


FIG. 44. DIAGRAM OF GEARING ON THE FALES AND JENKS TWISTER.

to those on the spinning frame. This is always done in making two-ply yarns, but is not necessarily held to in making yarns for special purposes, where the yarn is doubled and twisted and the ply yarns again twisted making a 4-ply yarn or higher.

In calculating the amount of twist for ply yarns, the figures are always based on its equivalent to single yarn. For illustration, the twist put in 2/50s using 4 as a twist multiplier, would be as follows:

2/50s is the equivalent of a single 25s, then, $\sqrt{25} \times 4 = 20$ turns per inch twist in the yarn.

In the same way 3/50s would have $\sqrt{16.67} \times 4 = 16.33$ turns of twist per inch.

Fig. 44 shows a cut of the geared end of a twister built by Fales & Jenks Machine Co., Pawtucket, R. I. This type of gearing is similar to most twisters and consists of two front roll gears of 112 teeth, driven by two large intermediates that are in gear with each other. One of the intermediates is driven by the twist change gear which is carried on the stud with the jack gear of 96 teeth. The cylinder or drum gear of 30 teeth, located on the end of the cylinder, drives the jack gear. The roll is 1½ inches in diameter, the cylinder 8 inches in diameter and the whorl on the spindle is 1 inch in diameter. The ratio of the cylinder to the whorl is 1 to 7.04.

The twist factor is found by the same method as used on the spinning frame. The circumference of the 1½ inch roll is 4.71 inches.

$112 \times 96 \times 7.04 \div 4.71 \times X \times 30 = 535$ twist factor.

Factor ÷ Gear = Twist per inch.

Factor ÷ Twist per inch = Gear.

There is a large range of twist possible with this frame and its construction allows the cylinder gear to be varied considerably without changing the size of the jack gear, the cylinder and twist gears being interchangeable, thus giving two or more sets of twists for the same set of change gears. In another model of this machine, using compound twist gearing, the gears being interchangeable, it is possible to get almost any desired range of twist with but few gears carried in stock.

Fig. 45 shows a cut of the geared end of the Hopedale twister, built by the Draper Co., Hopedale, Mass. This gearing is similar to the one just shown. In this case, however, the gear on the end of the drum is the change gear. The drum or twist change gear and the stud gear are interchangeable, the pin carrying the jack and stud gears, working in a slot in the jack gear arm, is movable thus allowing a change in the distance between gear centers which permits of the using of any size drum gear without any change in the size of the jack gear. With this arrangement and a few extra gears it is possible to get almost any desired twist.

With the roll 1½ inch, drum 8 inches and whorl 1 inch in diameter, the following gives the twist factor:

$90 \times 120 \times 7.04 \div 4.71 \times 32 \times X = 504$ twist factor.

Factor ÷ Gear = Twist.

Factor ÷ Twist = Gear.

Then a twist gear of 30 teeth will give 16.8 turns per inch twist, as follows: $504 \div 30 = 16.8$.

If the stud gear is changed we get an entirely new value to the train of gearing and consequently a different set of twists for the same twist gears. Suppose we put on a 36 tooth gear in place of the 32 tooth stud gear. This will have the effect of increasing the front roll speed thus de-

creasing the twist. We can then get our new factor as follows:

Multiply the present factor by the stud gear on the frame and divide by the stud gear that is to be used. $32 \times 504 \div 36 = 448$ twist factor with 36 tooth stud gear.

A twist gear of 30 teeth will give only 14.9 turns of twist instead of 16.8 as before as $448 \div 30 = 14.9$ turns of twist.

This variation from the former standard will be present in the same proportion with all the twist gears used, so it will be seen how easy it is to obtain a new set of twists with the use of the same gears.

PRODUCTION.

The production of a twister depends upon the spindle speed, the twist in the yarn, the size of the yarn and the time lost, and can be figured from the size of the yarn and the roll delivery, or from the spindle speed and size of yarn, and the twist. The time lost while doffing, creeling

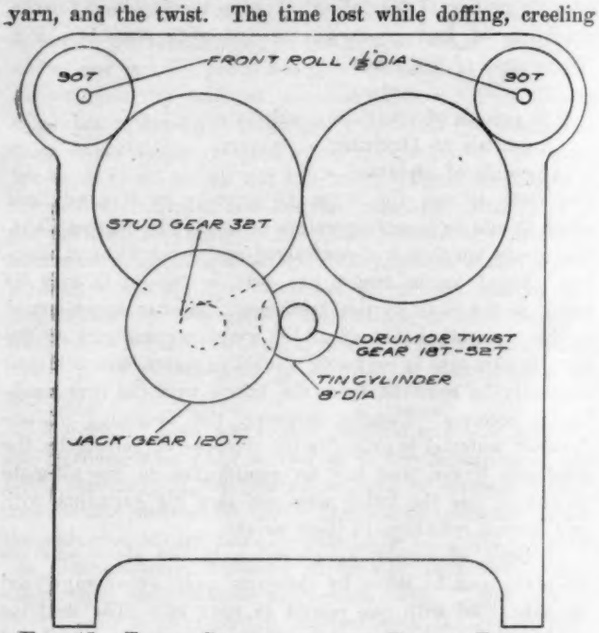


FIG. 45. TWIST GEARING ON THE DRAPER TWISTER.

and oiling varies with the size of the yarn, the amount of twist run, the number of the ply and the size of the bobbins made, being greatest when running the lower numbers of yarn.

Example. A twister on 2/30s yarn has a front roll speed of 80 R. P. M. Time lost 10 per cent. Diameter of front roll 1½ inch. What is the production per spindle for a 10 hour day? Circumference of the 1½ inch roll is 4.71 inches.

$4.71 \times 80 \times 10 \times 60 \times .9 \div 36 \times 15 \times 840 = .448$ pounds.

In the above calculation 15 is used instead of 30 as the yarn after twisting is the equivalent of a single 15s yarn.

If we consider 10 per cent to be a good fair average for loss of time while doffing, oiling, etc., we can see that there are only two variable quantities in the above production calculation, the speed of the roll and the size of the yarn. Now if we leave these two quantities out and work out the value of the remaining figures we get the production constant, as follows:

$4.71 \times 10 \times 60 \times .9 \div 36 \times 840 = .0841$ production constant.

If the production constant is multiplied by the roll speed and divided by the equivalent counts of the twisted yarn, the result will be the production per spindle, as follows:

$.0841 \times 80 \div 15 = .448$ pounds per spindle.

It will be noticed that this gives the same result as gotten in the first calculation. This constant only holds good on frames with a 1½ inch roll and is based on a 10 hour day with a 10 per cent allowance for loss of time.

When two yarns are twisted together there is a tendency for the yarns to contract and become shorter. This increases the weight of the yarn, causing it to be heavier than is expected. The amount of this contraction varies with the amount of twist put in both the single and the ply yarns. If two hard twisted single yarns were doubled and twisted slack, the tendency to contract and become heavier might be overcome by the opposite action going on in the single yarns. Under most conditions there is a contraction of the twisted yarns and to overcome this heavying up of the yarn while being twisted it is usual, where accuracy is desired in the size of the finished yarn, to spin the single yarns a number or so lighter. In this case what is called 2/40s is not twisted from 40s yarn but from 41s or 42s single yarn. The amount of variation in the numbers depending upon the amount of contraction in twisting and this in turn depending upon the amount of twist in the yarns.

(To be continued.)

[NOTE.—At the conclusion of this series of cotton machinery calculations, Prof. Parker expects to republish them in book form. This announcement will be of especial interest to those later subscribers to COTTON who have been unable to secure back numbers.—Editor.]

From present indications the volume of trade for Cape Province for 1912 will show a decided increase both in imports and exports over the preceding year. Exports valued at $508,724 (126 invoices) were sent from Port Elizabeth to the United States during the quarter ended March 31, as against $464,300 (91 invoices) during the same period in 1911 and $359,700 (66 invoices) in 1910.

Imports for the first two months of 1912 totaled $7,450,250 and in 1911 $6,609,879, or an increase of $840,000. The combined imports for this consular district (Port Elizabeth and East London) for January and February, 1912, were $11,158,873, an increase of $1,681,000 over the same period last year. These figures are significant as indicating the increasing commercial importance of this district. No other South African port shows such an increase.

While English manufactures have by far the greater portion of this trade, American manufactures are being imported in quantities which compare very favorably with the increased bulk of trade.

William Hathaway, Superintendent of the Barnard Mills of Fall River, Mass., has resigned from that position. He has been succeeded by Richard Boardman, formerly overseer of weaving at the King Philip Mill in Fall River. Mr. Boardman's former position at the King Philip Mill has been accepted by Mr. Talbot of the Flint Mills.

The European Bureau of American Manufacturers at Berlin, Germany, would like to correspond with all manufacturers who may be open for direct export. Manufacturers interested should address R. Wohlfarth, General Manager.

KNITTING.

THE WEIGHTING OF KNIT GOODS.

(Contributed Exclusively to COTTON*)*

BY J. MERRITT MATTHEWS, PH. D.

There seems to be a growing tendency on the part of some manufacturers of cotton knit goods to add a weighting material to their fabric. This is for the purpose of giving a greater apparent fullness of fabric by using really less yarn than supposed, the deficiency of yarn being made up by the addition of some cheap substance which will bring up the weight to the desired point. This tendency of the manufacturer to entertain a sophistication of his fabric has received considerable impetus during the past two years by the continued high price of cotton.

Though the weighting of silk and woolen goods is an old practice, as is also the weighting of cotton cloth in bleaching, the addition of a weighting substance to such a fabric as a knitted cotton cloth is a rather recent enterprise. There are several difficulties in the way of applying the ordinary processes of weighting such as are commonly practiced in the case of woven cotton cloth. In the first the open character of the mesh of a knitted fabric does not allow of the use of a filling material such as is commonly employed for filling up the mesh between the yarns of a woven fabric. In the second place, the irregular and broken surface of the knitted fabric precludes the use of such a filling or the ordinary methods of applying the same. In the third place, the essential quality of the knitted fabric is its great elasticity, whereby it may be stretched out considerably but tends to return it to its original form, so that it more or less closely adheres to the surface of the object which it encloses. If the ordinary methods of filling and weighting were employed on such a fabric this essential quality would be destroyed; or from another point of view, the very elastic quality of the fabric precludes the possibility of using the ordinary method of filling and weighting. In the fourth place, it is necessary that a knitted fabric, especially for use as underwear, must be soft and pliable, and this quality must not be destroyed by the use of weighting or filling materials. In the case of ordinary woven cotton cloth it is often desirable to give the fabric solidity and stiffness by the use of filling materials.

Another point to be considered in the weighting of knit goods for underwear fabrics is that these goods are generally in the bleached condition; or if they are colored, it is only in very light tints, such as natural brown or Egyptian, pink, blue, etc. This precludes the possibility of employing any weighting materials which are colored or which would tend to damage the color of the fabric. In general it may be said that all weighting would be done on bleached goods, hence the weighting material must be either white or colorless.

Unlike wool and silk, cotton is not a substance which has much affinity or power of combination with metallic salts. While both silk and wool may be weighted easily by combining them with the salts of the heavy metals, it is not possible to do this in the case of cotton, for this fibre will not absorb the salts of such metals from their solutions.

It has, however, been found possible to add considerable weighting to both cotton yarns and cotton knitted fabrics by treatment with solutions of such compounds as magnesium sulphate or magnesium chloride, zinc sulphate, barium chloride, calcium sulphate, etc. In order to enhance the degree of absorption of the salts by the cotton fibre it is necessary to employ in conjunction with the solution of the metallic salts some adhesive material such as dextrin, and as the use of this latter ingredient is liable to add considerable stiffness or harshness to the fabric, it is also required to employ a softening agent such as glycerine and soluble oil.

1. *Magnesium Sulphate.* This is a cheap substance and is readily soluble in water; it also has no effect on the color or quality of the fabric. It may be employed for the weighting of knit goods in the following manner: For 100 pounds of cloth use

200 gallons of water,
120 pounds of magnesium sulphate,
15 pounds of Dextrine,
4 pounds of glycerine.

The cloth is run for about 20 minutes in this solution, which should be at a temperature of about 110 degrees Fahr. The goods are then hydroextracted and dried without washing. About ten to twelve per cent. of weighting may be added to the cloth by this treatment. It is to be remarked in this connection that all of the weighting material on the cloth in this case is perfectly soluble in water, and will consequently be removed from the fabric with the first washing it receives. Usually, however, the weighting of underwear material is only for the purpose of getting by the wholesale buyer, and has no significance to the ultimate consumer, for the latter does not buy his garments with any special reference to their weight.

Instead of employing glycerine in the above mixture its place may be taken by the same quantity of rape seed oil saponified with one pound of soda ash. The dextrine used in this process must be pure white dextrine and not the brown product which would cause a discoloration of the cloth. This method of weighting does not appreciably alter the appearance or feel of the goods.

2. *Magnesium Chloride.* This is a product very similar in character to the previous salt, and is even more soluble in water. It has the additional property, however, of being quite hygroscopic; that is to say, it readily combines and holds moisture. It is often used for this quality in the finishing and loading of cotton goods, as it prevents the material from becoming hard and dry, always retaining sufficient moisture in the fabric to keep it soft and spongy. The weighting of the knit fabric with magnesium chloride is carried out in the same general manner as with the sulphate, as follows: For 100 pounds of cloth use

200 gallons of water,
120 pounds of magnesium chloride,
15 pounds of dextrine,
4 pounds of glycerine.

Maintain this solution at a temperature of about 110 degrees Fahr., and run the goods for about 20 minutes; then hydroextract, and dry without washing. By the use of this salt from 12 to 15 per cent. of weighting may be added the fabric. The softness and color of the cloth is not impaired; in fact, the cloth is apt to present a somewhat

softer feel owing to the fact that the hygroscopic property of the magnesium chloride always maintains sufficient moisture in the goods to prevent it drying out harsh. Magnesium chloride is also more or less of a preventive against mildew, being better in this respect than magnesium sulphate.

3. *Zinc Sulphate.* This salt is also capable of being used for the addition of considerable weight to cotton goods, and has rather a wide use in connection with the finishing of cotton piece goods. It is easily soluble in water and may be applied to knit goods in much the same manner as the preceding compounds, as follows: For 100 pounds of cloth use

200 gallons of water,
120 pounds of zinc sulphate,
15 pounds of dextrine,
4 pounds of glycerine.

Maintain the temperature of the bath at about 110 degrees Fahr., and run the goods for about 20 minutes, then hydroextract and dry without washing. Zinc sulphate is also somewhat hydroscopic in property and like the magnesium chloride previously referred to has the quality of preventing the cloth from drying out too harsh. When employed in the manner indicated zinc sulphate will add about 14 to 16 per cent. of weighting to the goods without any apparent alteration in the feel or color. Zinc sulphate is also a good preventive against the formation of mildew, and in fact zinc salts are largely used as an addition to other finishing compounds for this purpose; it is also a cheap salt, a factor which is of considerable importance in the question of weighting.

The use of both magnesium chloride and zinc sulphate are attended with some danger as to the tendering of the cloth, especially if the treated material is exposed to any considerable degree of heat. Magnesium chloride under the influence of dry heat is very liable to suffer more or less decomposition, becoming dissociated into free hydrochloric acid and the basic magnesium salt. If free hydrochloric acid is generated in contact with the cotton fibre and especially if in a heated condition, the cellulose of the fibre will be attacked with the formation of hydrocellulose, and a consequent breaking down of the cellular structure of the fibre. This results in a weakening or tendering of the cloth. Care should therefore be had not to dry cloth containing magnesium chloride at too high a temperature. There is also danger of dissociating the magnesium chloride by the hot pressing of the garments containing it. These same remarks may also be applied to the case of zinc sulphate. There are also certain conditions which bring into play electrolytic actions that result in a dissociation of zinc sulphate, and these may cause this salt to produce a tendering of the cloth. In fact, zinc sulphate may be described as a "corrosive" salt, and it must be used with due care and proper precaution in order to prevent any deleterious effects from afterwards developing in the cloth containing it.

4. *Calcium Chloride.* This salt is very cheap and is highly hygroscopic in character. It is extensively employed in the preparation of finishing compounds on account of this special feature. It is so hygroscopic, in fact, that in the case of the present question of weighting knit goods, it would not be feasible to use it alone as such, as an addition to the fabric. It would cause the material to maintain too moist a condition. Calcium chloride is also quite corrosive in its action, by reason of readily becoming dissociated with the formation of free hydrochloric acid, thus tendering the fabric. In order to employ it properly for weighting as desired in the case under consideration it is necessary to convert it by proper treatment into an inert compound. This is best done by first impregnating the cloth with the solution of calcium chloride and then treating with a solution containing a soluble sulphate, such as sodium sulphate (Glauber salt). This will convert the calcium chloride into the inert calcium sulphate, which is also highly insoluble. The process may be conducted in the following manner: For 100 pounds of cloth use

200 gallons of water,
120 pounds of calcium chloride (fused),
5 pounds of dextrine.

Work the goods for 20 minutes in this solution at a temperature of 110 degrees Fahr. Then pass through squeeze rolls with moderate pressure and run into a second solution containing

200 gallons of water,
100 pounds of sodium sulphate (crystals),
10 pounds of dextrine,
4 pounds of glycerine.

The goods are run in this second bath for 20 minutes at a temperature of 110 degrees Fahr., then squeezed out, hydroextracted and dried without washing. The second bath will become cloudy owing the the precipitation of more or less calcium sulphate in the solution. If too much calcium chloride is left adhering to the cloth after coming from the first bath, there will be considarable loosely adhering precipitate on the surface of the goods, and this will cause a dusting-off after drying. The operation must consequently be conducted in such a manner as to squeeze off most of the surface solution from the cloth coming out of the first bath. Calcium sulphate is a white compound and exists in the form of a very finely divided precipitate in the fibre. It is well to use a small proportion of the dextrine in the first bath in order that the calcium chloride may be properly absorbed from solution, otherwise the cotton will take up but very little of the salt, and most of the resulting precipitate of calcium sulphate will be thrown out on the surface of the fibre in the second bath. This will result in the cloth dusting badly when dried. Though calcium chloride is such a strongly hygroscopic substance, the sulphate of this metal which is obtained as the final weighting material in this case, is not at all hygroscopic; hence the cloth weighted in this manner will not have the softness and sponginess characteristic of the fabrics weighted by the previous methods. The calcium sulphate, however, has the advantage over the magnesium chloride and zinc sulphate in that it is perfectly inert in its effect on the cotton cellulose, and there is consequently no danger of its tendering the fabric by the liberation of free acid. It also has the advantage of being very highly insoluble, whereas the other salts so far discussed are all very soluble in water. Hence the weighting with calcium sulphate will be of a more permanent character in this respect.

5. *Barium Chloride.* This is a salt somewhat similar to calcium chloride, though it does not possess the strong hygroscopic features of the latter compound. The compounds of barium are all of high density, that is to say, a relatively small volume of the substance weighs very heavy. This is naturally of great advantage in the consideration of weighting materials. Owing to the fact that

barium chloride is not especially hygroscopic it may be employed after the manner of the magnesium salts. Better fixation of the weighting material, however, may be obtained by converting the chloride into the sulphate by treatment with a solution of sodium sulphate as in the application of the calcium chloride. The operations are conducted as follows: For 100 pounds of cloth use

200 gallons of water,
120 pounds of barium chloride,
5 pounds of dextrine.

Maintain the solution at a temperature of 110 degrees Fahr., and run the goods for about 20 minutes. Pass through squeeze rolls so as to remove the excess of liquor, and then run into a solution contained in a second bath as follows:

200 gallons of water,
100 pounds of sodium sulphate,
10 pounds of dextrine,
4 pounds of glycerine.

Run the goods in this second bath for 20 minutes at a temperature of 110 degrees Fahr.; then squeeze off, hydroextract, and dry without washing. By this treatment the highly insoluble barium sulphate is precipitated within the fibre. As stated in the case of the calcium sulphate method, it is necessary to so adjust the conditions of the work as to prevent a surface precipitation of the barium sulphate on the fabric, otherwise it will dust off badly when dried. Barium sulphate is perfectly inert in its effect on the cellulose of the cotton fibre, consequently there is no danger of the formation of free acid which leads to the tendering of the cloth.

Comparative Tests of Weighting Materials. In order to compare the efficiency of the foregoing methods of weighting cotton knit goods a series of actual tests in weighting were made under exact quantitative conditions.

The following table exhibits the results of these experiments:

No.	Method.	Wt. of untreated fabric, air-dry Grams.	Wt. of treated fabric, air-dry Grams.	Weighing, Percent
1	Magnesium sulphate	8.4	9.4	12
2	Magnesium chloride	8.1	9.2	13
3	Zinc Sulphate	6.2	7.1	14
4	Calcium chloride	7.3	8.5	16
5	Barium chloride	8.4	9.7	15

By use of the latter two methods a weighting of 14 to 18 per cent. may be obtained on the cotton fabric. The barium sulphate method gives a very white cloth, in fact the treated cloth may be whiter in appearance than the untreated cloth. The use of the glycerine in the second bath prevents the hardening of the fibre which would otherwise be the case if this compound was omitted from the mixture. The goods, however, weighted with calcium and barium chloride are not quite as soft as when the magnesium and zinc compounds are employed. The appearance of the fabric is also not quite as bright. This is to be accounted for by the fact that the weighting compound in the case of the calcium and barium salts consists of a fine white powder, which rather deadens the color of the cloth. The tone of the white is not necessarily disturbed, only it is made somewhat less lustrous. This is more to be observed in the case of the barium sulphate weighting than with the calcium sulphate. Also the former compound makes the cloth of a whiter appearance than the latter.

Comparative Cost of the Different Methods. The item of cost in the consideration of weighting cotton goods is an important consideration, for the method must be essentially a cheap one, by reason of the character of the goods being weighted. The following tables present in a compact form the comparative costs of the different methods considered with reference to the materials or chemicals employed. These are all based on the treatment of 100 pounds of goods.

No. 1. Magnesium Sulphate Method.

120 pounds Magnesium Sulphate @ 1½c	$1.80
15 pounds of dextrine @ 3¼c	.49
4 pounds of glycerine @ 20c	.80
	$3.09

No. 2. Magnesium Chloride Method.

120 pounds Magnesium Chloride @ 1½c	$1.80
15 pounds of dextrine @ 3¼c	.49
4 pounds of glycerine @ 20c	.80
	$3.09

No. 3. Zinc Sulphate Method.

120 pounds Zinc Sulphate @ 2½c	$3.00
15 pounds of dextrine @ 3¼c	.49
4 pounds of glycerine @ 20c	.80
	$4.29

No. 4. Calcium Chloride Method.

120 pounds Calcium Chloride @ 1c	$1.20
15 pounds of dextrine @ 3¼c	.49
100 pounds Sodium Sulphate @ ¾c	.75
4 pounds of glycerine @ 20c	.80
	$3.24

No. 5. Barium Chloride Method.

120 pounds Barium Chloride @ 1½c	$1.80
15 pounds of dextrine @ 3¼c	.49
100 pounds Sodium Sulphate @ ¾c	.75
4 pounds of glycerine @ 20c	.80
	$3.84

These figures will represent the cost of the different methods as far as the chemicals employed are concerned provided the baths are used only once. If much work is to be done, however, these baths could be employed over and over again, for only a comparatively small proportion of the metallic salts in any of the methods are taken up by the fibre, and consequently when the bath is used for the second or third times, decreasing amounts of salts are added. In the case of the second baths when the calcium chloride and barium chloride methods are employed, it will not be well to use them a second time on account of the large amount of sediment which collects in them, and which will result in the cloth dusting off badly when dried.

For standing baths, it has been found that the following proportions are approximately correct in order to yield the same degree of weighting each time:

	2d Bath, pounds.	3d Bath, pounds.
No. 1. Magnesium Sulphate Method:		
Magnesium Sulphate	15	10
Dextrine	4	3
Glycerine	2	1
No. 2. Magnesium Chloride Method:		
Magnesium Chloride	17	12
Dextrine	5	3
Glycerine	2	1
No. 3. Zinc Sulphate Method:		
Zinc Sulphate	17	12
Dextrine	5	3
Glycerine	2	1
No. 4. Calcium Chloride Method:		
Calcium Chloride	20	17
Dextrine	2	1
No. 5. Barium Chloride Method:		
Barium Chloride	20	17
Dextrine	2	1

Calculated on the basis of a standing bath, and in the last two cases using fresh sodium sulphate baths each time, the following figures will represent the comparative costs of the several processes with respect to the chemicals per 100 pounds of cloth:

No. 1. Magnesium Sulphate Method.....$ .45
No. 2. Magnesium Chloride Method..... .48
No. 3. Zinc Sulphate Method..... .60
No. 4. Calcium Chloride Method..... 2.33
No. 5. Barium Chloride Method..... 2.42

The comparatively high costs of the last two methods is caused by the fact that the process requires the use of two baths and that the second bath cannot well be used over again.

PRODUCING A BLUISH CAST ON ANALINE BLACK.

EDITOR COTTON:

In the dyeing of hosiery with aniline black where the dyestuff is developed by aging in circular revolving cages in a steam-heated room, the black takes on a brownish cast, whereas I am anxious to obtain a bluish cast to the color. Can you explain how this may be done?

Answer.—In the development of an oxidation aniline black by aging it may give rise to a brownish cast of color through a variety of reasons. In the first place, it must be understood that the aniline of commerce is not really pure aniline, but consists of more or less actual aniline mixed with proportions of toluidine and often with some xylidine. These two substances are what are known as homologues of aniline, and occur along with it in the process of manufacture. Aniline for use in the dyeing of black by the oxidation process should not contain much xylidine, as this compound on oxidation gives rise to a brownish color. Toluidine is a substance which is known in three isomeric modifications, though as it occurs in commercial aniline oil, it is present in only two of these isomers. These are known as ortho-toluidine, which is a liquid, and para-toluidine, which is a solid, though it will be found more or less in solution in the aniline.

Ortho-toluidine on oxidation produces a black which is only a little less blue than that produced from pure aniline, having a somewhat violet tone, though in its general properties it may be considered a very fine color.

Para-toluidine, however, when oxidised produces a brown color which is somewhat more yellowish than that obtained from xylidine. It is however, less sensitive to change by the action of acids than the color obtained with xylidine.

The mixture of ortho-toluidine and para-toluidine furnishes a good full shade of black of great fastness, provided the two compounds are present in the proper proportions. If however the para-toluidine is in excess there will be a tendency for the black to assume a brownish tone. This will also be true if xylidine is present in the mixed aniline oil or salt in sufficient proportion to make its browning influence felt. Pure aniline itself gives an oxidation black of a decided bluish tone; if, however, there is present in the aniline proportions of the two toluidines and xylidine, the blue tone will be neutralised and a deep dead tone of black will result. If, on the other hand the proportions of the para-toluidine and xylidine are too great the tone of black on development will be of a brownish cast.

It is a mistake, however, to suppose that a black derived from pure aniline would be more acceptable than one from the mixed compounds, for the color obtained from pure aniline, though of a bluish tone, lacks fullness and density, and also has the defect of greening badly when in contact with acids. This is an especially bad feature to be present in a black to be employed for the dyeing of hosiery, as the color will turn green through the action of the perspiration on it. The greening quality of such blacks may be avoided by a superoxidation of the aniline in the dyeing of the color, but this is liable to lead to excessive tendering of the fibre, and also the color does not acquire as fine a tone, becoming of a brownish cast. If the aniline mixture, however, contains suitable proportions of toluidine and xylindine, the black which is obtained will have great depth and fulness and will be of a neutral tone, and will not have the defect of turning green.

Another cause of the browning of aniline black in development by oxidation is what may be termed "superoxidation;" that is to say, the oxidation is too vigorous and rapid, or too prolonged in its action. The oxidation of aniline black should be so regulated as to be stopped at the point when all of the aniline has been thoroughly oxidised. If a strong oxidizing action is continued beyond this point the coloring matter itself becomes oxidized, with the result that a decomposition of the color lake takes place leading to the formation of brown resinous matters which would naturally produce the browning defect noticed by our correspondent. This superoxidation may arise through the use of too great an amount of oxidizing material in the mixture of the dyebath employed. Sodium chlorate or potassium chlorate are the oxidizing substances usually employed for this purpose and these are both very vigorous oxidizing agents, and if added in too great a proportion beyond that needed for the complete oxidization of the aniline present, there is grave danger of the superoxidation of the aniline mixture taking place and the resulting formation of the brown composition products. This superoxidation may also be induced by having too high a heat in the oxidation room, causing the oxidation action of the chlorates to proceed in too rapid a manner. This results in the over-oxidation of some of the aniline while the remainder may be still improperly and incompletely oxidized.

Another cause of browning in the dyeing of aniline black may be from the use of iron salts in the mixture

employed for dyeing. Such iron salts may be copperas (sulphate of iron) or potassium ferrocyanide (yellow prussiate of potash). Both of these compounds under improper conditions of oxidation may result in the formation of oxide of iron in the fibre. This compound is of a brown color and may thus give its browning tone to the black.

The exact cause of the defect about which our correspondent complains could only be definitely determined by a consideration of the formula he uses in the production of his black and by a careful examination of the conditions of oxidation which the black undergoes, as well as the character and purity of the aniline he is using. The proper method, of course, to overcome this difficulty is to so perfect the conditions of the dyeing and oxidation processes that the formation of the brown color will not take place.

A make-shift method is to neutralise the brownish tone of the color by topping with a blue dyestuff; this method is often resorted to by dyers who cannot produce a perfectly dyed aniline black. Such dyes as Methylene Blue of various brands suitable to the tone of black desired are mostly employed. Methylene Blue is a basic dyestuff, and while it will not combine with cotton directly, it will combine with the aniline black dye in the fibre and thereby yield quite a fast color lake. It is only necessary to use a small amount of the blue dyestuff, and this may be applied in the soaping bath which is usually given to the dyed stockings for the purpose of washing and softening the fibre. Of course, a black toned in such a manner, will not have the same fastness to washing and wear as a pure dyed aniline black.

DYEING, BLEACHING AND FINISHING.

THE ASPECT OF COLORS UNDER ARTIFICIAL LIGHTS.

(Contributed Exclusively to COTTON*).*

BY DAVID PATERSON, F. R. S. E.

PART I.

In the careful discrimination of the immense number of different shades of color we possess in the arts and manufactures, one of the most important of questions is that of the quality of the light illuminating the colors. To the great majority of people who are not colorists, the ordinary sunlight appears always much the same; the light of one day seems as good as another. But to all those whose business it is to accurately match all kinds of colors and to note the slightest variation in their appearance, the daylight is found to be most changeable in its quality. One day it may be beautifully pure and white, and excellently suited for accurate color discrimination, but the next day it may have a bluish tinge, caused by an excess of blue rays reflected from a particularly blue sky. Or again it may show a yellowish, or orange tinge due perhaps to foggy weather, or dense atmospheric conditions. Indeed it may appear strange to many readers, but it is a fact that some times the sunlight will alter twice or thrice in the course of the day. To the majority of mankind this, of course, is a question of little importance; but to artists and colorists, especially dyers, it is often a serious difficulty.

This unstable quality of ordinary daylight has caused it to be discarded by the philosopher, when engaged in scientific color work requiring the highest degree of accuracy. The electric arc light has been found to be more reliable as a standard for such work. But for the everyday work of life, the sunlight will always be the universal standard and it becomes our duty to study and adapt ourselves to its varying moods. As a rule, the purest day light is found in the month of May and coming from a northerly direction. In color matching in laboratories and experimental dyehouses, a north light is always preferable. The light coming from this direction is always sure to be well diffused and of a good quality of whiteness.

The direct rays of the sun have always a yellowish tinge, while the light reflected from a blue sky has a decidedly bluish tinge. These two differently colored lights, the yellowish and the bluish, when mixed together, or "deffused," become a good white. In the optical mixing of yellow and blue, a white is produced. This, then, is always taken as the best standard of daylight for all practical color purposes.

In speaking of laboratory windows, it is well to remember that no large expansive colored object must be in front of them; otherwise the light will be reflected from the colored surface and acquire a tinge of the same color. For example, a dyer has found, on viewing a series of reds and orange colors, that they seemed to appear to the eye somewhat dull and flat, and wanting in vigor. But, it was afterwards found that the cause for this, really lay in the quality of the light coming through the window of the matching room. In front of the window was a beautiful expanse of rich green field or meadow and the sunlight reflected from this, acquired a strong greenish hue, which gave to the colors examined their dull and flat appearance.

EFFECT OF STRONG ILLUMINATION.

If colors be examined under strong direct sunshine, it will be observed that they look both lighter and yellower. In the shadow they assume a bluer and more violet appearance. Artists are well aware of this, and when they wish to represent a scene under intense light, they use much lighter and yellower, or "warmer" hues. This is particularly noticeable in Eastern life. The bright and gorgeous dresses of the East appear much lighter and less crude in color under the blazing sunlight. All intense, strong illumination has this power of making colors appear lighter and yellower. It is not so much that the light itself has a predominance of yellow rays, or that the colors themselves are impure and contain yellow; but because of an interesting physiological fact which may be here described. The colors of the spectrum, *i. e.* those produced by passing a beam of light through the prism, are all perfectly pure, purer than any dyes or pigments we could ever possess.

Now it has been found by Helmholtz, Von Bezold, Rood and others, that if intense white light be added to these perfectly pure spectrum colors, they undergo much the same changes in appearance as dyes or pigments. For example, pure red under a strong light becomes yellower and approaches to a scarlet color; scarlet becomes yellower and looks more like orange. Orange becomes more like a yellow; while yellow itself looks much lighter and whiter,

almost a white. Green becomes considerably yellower and appears a yellow green; while blue becomes much lighter, and violet is not only lighter but bluer. These modifications are very similar to those produced on any manufactured colors, with the exception perhaps of the blue and violet. Such coloring matters are always more or less impure and change considerably according to their optical composition. Some blues go greener, others redder; and violets nearly always look redder under such an illumination.

COLOR PERCEIVING NERVES.

According to the most accepted theory of color vision at the present day, there are in the retina of the eye, three sets of color perceiving nerves. One set responding to the vibrations of red light, another to green and another to violet vibrations. These form the three primary color sensations of the young—Helmholtz theory. The most sensitive nerves seem to be the green perceiving ones, and for bright illumination, the red seeing nerves come next and the violet ones the least sensative. But in a light of very low luminosity, strange to say, the violet perceiving nerves are much more sensitive than the red ones. This is the reason why objects, seen under a low degree of luminosity, assume a greenish blue aspect; a moon lit landscape for example. The effect of an intense illumination on the color nerves may be illustrated in a very simple way.

When we look at a pure red color, the red percieving nerves are alone stimulated; the green and violet ones remain inactive. This is simply illustrated in Fig. 1 where the tall column R represents the degree of stimulation

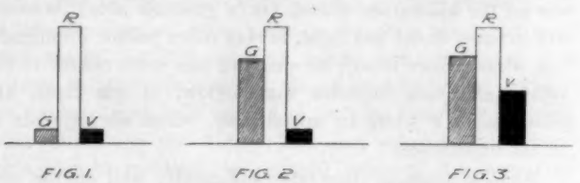


FIG. 1. FIG. 2. FIG. 3.

FIG. 1. REPRESENTS THE RED COLOR NERVE (R) STIMULATED, GREEN AND VIOLET, (G & V) INACTIVE.

FIG. 2. REPRESENTS THE EFFECT OF STRONGER ILLUMINATION. THE GREEN NERVES (G) BEGIN TO BE STIMULATED AS WELL AS THE RED. VIOLET STILL INACTIVE.

FIG. 3. EFFECT OF STILL STRONGER ILLUMINATION. THE VIOLET NERVES (V) ALSO BEGIN TO BE STIMULATED.

given to the red nerves; while G and V (Green and Violet), remain dormant.

If the light be greatly increased, the green perceiving nerves begin to respond to the light vibrations, see Fig. 2, which gives to the color red a yellowish tinge making it look like a scarlet; the small amount of green nerve excitement combining with that of the red to form a yellow. It has to be remembered that red and green lights combining on the retina produce the sensation of seeing yellow.

But the violet nerves still remain unaffected. If the light be still further increased to a dazzling brilliancy, the red color examined will appear still yellower, passing from a scarlet to an orange color and also look lighter as described in the preceding paragraph. Not only have the green nerves become further stimulated, producing more yellow, but the violet seeing nerves now come into play and respond to the greatly increased light; see Fig. 3 in comparison with 1 and 2. The sensation of violet combines with that of the red and green and the three combining together produce white light.

Thus, under a dazzling brilliancy of illumination, a pure red color may assume the appearance of an orange color. In a similar way the pure violet of the spectum may be made to look like a blue almost; by a strong degree of illumination. The green perceiving nerves become stimulated as well as the violet and the combined effect of the two, green and violet, is to produce a blue sensation.

The effect of a low illumination is quite the reverse of what we have just studied. The red perceiving nerves are slow to respond to a light of very low luminosity; while the green and violet ones respond more readily. The result is that in a low light things aequire a greenish blue, or "cold" aspect; while red and orange colors can scarcely be perceived at all. Red colors disappear first, violets next and last of all green colors. This explains the bluish appearance of moonlight scenes and the difficulty, in many cases the impossibility of seeing orange and red colors in the dim moonlight. It takes a full bright moon and the clearest of atmospheric conditions to see red, orange, scarlets and all such like; while dark reds, maroons and deep violets all appear as blacks.

The general effects produced in the appearance of ordinary colors like paints and dyed textiles by strong and weak illumination may be briefly tabulated as follows:

Colors.	Aspect under a White	
	Strong light.	Weak light.
Reds.	Brighter and yellower, more scarlet	Claret shade.
Orange.	Brighfer and yellower.	Brown or russet.
Yellow.	Much lighter.	Flatter, like a citrine.
Greens.	Brighter and usually yellower.	Duller and bluer.
Blues.	Considerably lighter and purer.	Somewhat lighter and duller in tone.
Violets.	Lighter, and as a rule redder, with the ordinary dyes.	Almost black, like a puce.

These are the usual effects observed, but often with dyed shades, especially the greens, blues and violets, many alter considerably in hue if they are not particularly pure colors. Some blues for example, may appear clearer and bluer under a brilliant white light; others may go reddish and appear dull and slatey. This is also found with many of the different kinds of violets used in the dyeing industry. Some go redder or more purple, while others go bluer under a bright light. Corresponding differences in behavior are likewise noted under a reduced illumination. This brings us naturally to the interesting and important study of the behavior of colors under the various different artificial illuminants.

COLORS IN ARTIFICIAL LIGHT.

Although to most people the change in the appearance of color when seen under artificial illuminaiton, is a matter of slight interest, yet to the dyer of textiles it is a question of great and increasing importance. None but a dyer can thoroughly understand and appreciate all the difficulties underlying the matching to perfection of certain shades. In order to make a perfect match in every respect to the shade desired it is, of course, necessary that they appear identical under any source of illumination. And it is here where the difficulty arises. A shade may be dyed to match perfectly in daylight the certain color desired; but, on viewing the two together in any artificial light, they may be found to be no longer a match to each other. Two soft dove greys, for example, may look practically the very

same shade in daylight, yet, when examined together under gas, or lamp light, or the electric glow-lamp, one may appear reddish and the other greenish, making the two shades totally disimilar. A dyer of silk may be successful in dying a perfect daylight match to a certain given sample shade dyed upon wool. The dyed silk and the original woollen material may then be made up into a lady's dress and present quite a uniform and pleasing color. But judge of the lady's disappointment and displeasure, when she finds that the dress cannot be worn in the evenings under artificial illumination, because the woollen material is of one color and the silk of quite a different color. A total want of uniformity and harmony is the result. These are every day perplexities with the dyer of dress materials, and it is to these problems we wish to devote the present series of articles.

The aspect of colors under an artificial light depends, first of all upon the quality of the light, and secondly, upon the optical composition of the dyes used in making the shades. The ordinary illuminants, such as coal gas, oil lamp, electric glow lamp, (with carbon filament), candle light, etc, are all exceedingly rich in the red and orange rays; with a corresponding deficiency of the blue and violet rays. This makes it impossible to get a correct idea of the true appearance of dyed shades when viewed under such lights as these. The purest and best light is the electric arc. This approaches nearer to daylight than any other illuminant. Yet with some particularly sensitive shades a difference can be observed and this slight difference from daylight effect can be overcome by using suitably tinted glass screens. Of this we hope to have more to say when considering specially the electric arc light.

The usual change in the appearance of all colors when viewed under the ordinary illuminants is already well known; and when the colors are of normal behavior *i. e.* possessing no peculiarities in optical structure, the modifications may be correctly described as follows:

NORMAL COLOR CHANGE UNDER GAS LIGHT.

Color.	Effects.
Reds	Brighter and more orange.
Orange	Brighter and yellower.
Yellows	Much lighter; faint yellow appearing white.
Yellow-Green	Loses yellow and appears greener.
Greens	Brighter and little yellower; but changes little.
Green-Blue	Darker and stronger; bluer as a rule.
Blues	Darker as a rule; reddish Blues go redder.
Blue-Violet	More Violet or redder considerably.
Violets	Duller and redder; deep Violets become black.

The above changes represent those seen under the ordinary class of artificial light possessing an undue excess of the orange and red rays. Those are gas light, candle light, oil lamp, electric glow-lamp; and very much the same appearance, though to a less extent, is observed under the acetylene gas light, oxyhydrogen lime light and various kinds of incandescent mantle lights.

It will be observed that no great changes are visible towards the red end of the spectrum, beyond looking brighter and somewhat yellower. But the colors at the other end of the spectum *i. e.* the blues and violets, show great and decisive changes. They are robbed of much of their blueness as gas light contains only some five per cent of the violet and 10 per cent of the blue rays of day light. Consequently very deep violets and dark navy blues look black in gas or candle light. There are not sufficient blue and violet rays to enable these colors to reflect them, hence they simply remain black. Reddish blues lose much of their blueness and appear red violets and violets look like

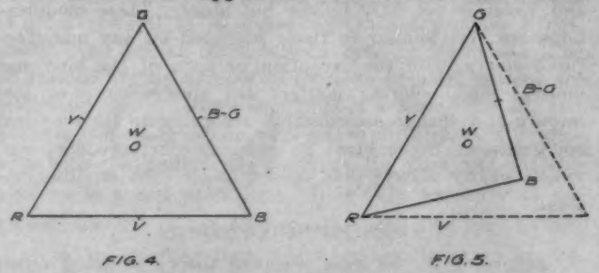


FIG. 4. NEWTONS NORMAL LIGHT DIAGRAM.

FIG. 5. NEWTONS DIAGRAM FOR GAS LIGHT COLOR CHANGES.

crimson almost, if they have the least reddish cast about them. Any little peculiarity of tone is accentuated under a yellowish light. All these normal color changes can be represented graphically by a simple and instructive diagrammatic method, for which we are originally indebted to Sir Isaac Newton.

The fundamental colors, red, yellow, green, blue, green, blue and violet are represented as a triangle. See Fig. 4. The primary colors, red, green, and blue are placed at the angles with white (W.) in the middle. In Fig. 5 the gas light effect on these colors is represented. While red and green remain practically unaltered, violet has approached nearer to red and become purple; likewise a blue on the violet plane, (or a violet-blue), comes nearer to red, and one on the blue-green plane, (or a greenish blue), becomes still greener under gas light, or any other yellow illuminant. The white center it will be observed has come nearer to the yellow and thus signifies that yellow, in gas light, approaches to a white in appearance, which corresponds to actual experience.

Such a diagram illustrates sufficiently well all the normal color changes seen under artificial illumination. It does not, however, represent the abnormal modifications many compound dyed shades undergo which so often distress and puzzle the dyer. These we hope to study systematically in the present series of articles.

Root Cotton.

Root cotton is found in the form of a fibrous covering on the roots of *Fagara integrifoliola*, a plant growing abundantly in Tobago Island, near Formosa, and in the Philippines. The fibre, from its behavior with reagents, appears to be composed essentially of lignin and suberin, and to be a kind of cork tissue homologous to the ordinary cork developed on the bark of trees. The fibres consist of exceedingly thin walled, empty elongated cells, of light straw color and silky lustre. They are very fine, soft and weak being easily pulverized to a waxy powder. They are less hygroscopic than ordinary cotton and show remarkable resistance to wetting by water. The root cotton is used by the natives of Tobago Island for caulking the seams of boats and in the Philippines for stuffing pillows. It can be removed from the root of the plant without injuring the latter, and it is suggested that the cultivation of the plant and the collection of root cotton is suitable for technical applications.

WATER PURIFICATION FOR TEXTILE PROCESSES.

(Contributed Exclusively to COTTON.)

BY J. C. W. GRETH.*

In the manipulation of cotton in the various processes of manufacture in which water plays a part, the character of the water used is a factor which is rarely, if ever, given proper consideration.

In the various processes involved in the bleaching of cotton goods, it is, of course, evident that the water must be free from suspended matter. However, in the washing or scouring processes, some of the soluble impurities in the water produce bad effects that cause a great deal of extra manipulation and often an inferior product. Of these soluble salts in water, the lime, magnesia and iron, (the impurities which make water hard) are the most objectionable. Some of these are precipitated in the fibre of the goods in the lime and lye boils, and it is questionable whether all of the precipitated substances can be removed either with repeated washing or scouring processes. While the precipitated substances may be bleached in the "chemic," a discoloration due to the presence of the precipitate may later on appear, especially is this the case if the goods are afterwards dyed, or starched and blued, and in fact in bleaching cotton goods to be dyed it is absolutely essential to remove every impurity which can affect the dye.

Iron is, of course, the most objectionable impurity in water used in connection with bleaching. The yellow spots or discoloration so often seen on bleached goods as they come out of the final washing, are in many instances, due to iron, in others to some of the other salts which prevent the various chemicals employed in the bleaching process from acting on the fibre. The cost of removing these spots, not to mention the reduced value of the output is an item of considerable expense. Further, no matter how carefully goods may be handled that are bleached with hard water, they do not have the texture of goods bleached with soft water.

In dyeing, the character of the water is of even more importance, the most injurious impurity in dyeing, as in bleaching is iron, since it "saddens" the shade in most colors. Excepting for turkey reds and logwood, a hard water is decidedly objectionable and interferes with obtaining the full color values and in the general quality of the goods, aside from the effect of its use in the preparation for dyeing.

There is probably more money wasted for the correction of difficulties chargeable entirely to the water supply than for any other factor entering into the various processes in connection with the turning out of high grade cotton goods.

Hard water is objectionable in bleaching, since even if it be free from iron, other injurious substances from such a water will be precipitated in some of the processes used to remove grease, wax, size and resinous matter.

Hard water is objectionable since cotton goods are usually dyed in alkaline or neutral baths, and it is especially so in the alkaline bath, as the precipitate formed from the impurities in the water interferes with the action of the dye stuffs. Goods to be dyed must be clean and free from grease, wax, size and resinous matter of all kinds. Such a condition can be affected only by the proper preparation in the preliminary processes with a water of proper quality as the medium. The most characteristic defect due to hard water are the lime spots on yarns and fabrics and which in turn are responsible for "clouds" or uneven areas.

Whenever washing is necessary in the treatment of cotton goods in bleaching or dyeing operations, it implies the complete washing away of the last trace of soaps, alkali, bleach, acid and dye liquors, leaving the goods clean for the next process through which they must pass. It is impossible to make perfect goods with water having impurities in suspension, or with water having soluble impurities that are subject to chemical reaction with the various soaps, alkalis, dyes, etc.

The steam used in the various "boils" in kiers or vats, in bleaching and in dyeing, becomes a factor since the condensed steam in mixing with the various baths and in coming in contact with the goods, will introduce any impurity carried by the steam from the water in the boiler. This, in many cases, may be of minor importance, yet it is a factor which must be reckoned with in turning out high grade goods. Steam is supposed to be pure water and is, but, as a matter of fact, very few boilers make perfectly dry steam.

The amount of water, as such, which is carried with steam varies, but whatever the amount, since it is taken from the boiler, it carries in solution and suspension, the same impurities as the water in the boiler, therefore, if water containing objectionable impurities is fed into the boiler, these impurities will, as a result of the evaporation, concentrate and water in the steam will bring them in contact with the goods. In many cases this is the cause of trouble, especially if iron is present in the boiler feed water, or if it contains other impurities of such a nature as to corrode the metal with which they come in contact, and in this way introduce iron into the various processes in which steam is used. It is plain that in some instances the impurities in water cause trouble in the use of the steam made from it as well as in its direct use, and in other cases the water itself may not give trouble but the impurities carried only in the steam may have a deleterious effect on the output.

The waste and expense due to scaled and corroded boilers must not be overlooked when the water question is being considered. The expense items for boiler maintenance are usually directly chargeable to the impurities in water. A scaled boiler fed with bad water cannot make dry steam economically, and even if boiler compounds are used to loosen the scale all that the most efficient boiler compound can accomplish is to change the nature of the scale forming impurities from those which adhere to the boiler iron to those which remain in suspension. No impurities have been removed, consequently, as these impurities increase the amount of impurity carried with the steam increases which from the standpoint of the bleacher and dyer only makes matters worse.

Uniformity in the amount and kind of impurities in water is of vital importance, in that different kinds and amounts of impurities affect different processes and dye stuffs in different ways, interfering with the uniformity and quality of the product.

*Manager of the Water Purifying Department of the Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

Since in the production of cotton goods such large quantities of water are required, natural supplies are depended upon. These are rarely, if ever, of such a quality that the best results can be obtained without considerable extra expense and waste. In many instances, the supply is soft, but contains at times considerable quantities of suspended matter. Other supplies are hard, which can be removed by the proper softening and purification of the supply.

The manipulation of cotton in the various bleaching and dyeing processes is a series of chemical reactions carried on between the various substances used and in some cases the fibre itself. Can there be any good reason advanced against the use of chemicals in preparing the water so as to have it uniformly soft and clear, or in other words of a constant quality? Does it not seem the rational thing to do so that the dyer can put the same dependence upon the quality of the water supplied that he does on the dye-stuff or any other chemical?

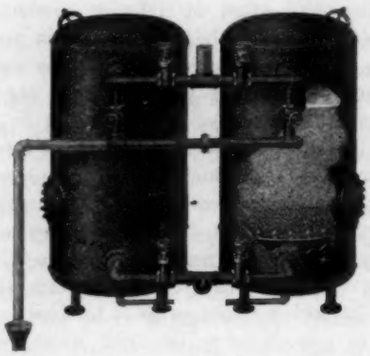
To enable him to depend on the water supply a properly designed water purifying apparatus must be used so that the quality of the water can be definitely foretold, just what impurities the water will or will not contain, and how the dyer is to compensate for them in all of his operations. When the dyer becomes familiar with the nature of the purified water, he can easily compensate in the various processes. The purified water will always be uniform in character so that the variation in the water supply will no longer be a factor in successful dyeing or in other processes of manufacture.

The annual waste of dye-stuff, labor and material due to variations in the natural water supplies will pay a handsome return on the investment made to obtain a uniform, soft, clear water for all the processes, not to mention the certainty by which the dyer can work and maintain a high grade product.

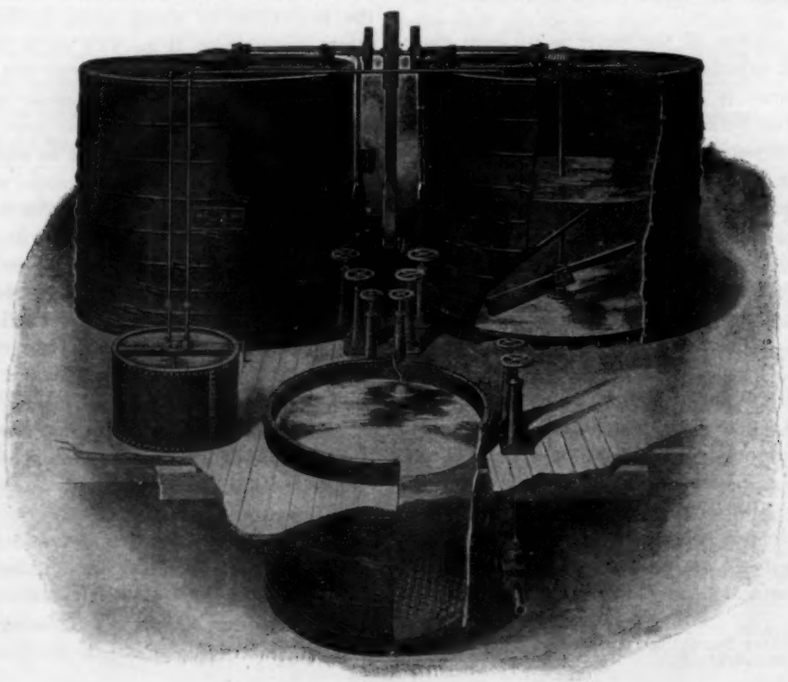
One of the water softening and purifying systems on the market which is giving excellent results in connection with cotton manufacturing processes, is shown in the accompanying illustrations and is known as the "We-Fu-Go" water softening and purifying system. In this system definite quantities of water are treated so that no matter how variable the nature of the supply may be, or the number of sources available, a uniform, soft, clear water can always be had.

The method used consists essentially of two or more treating and settling tanks, equipped with mechanical stirring devices operated by power, a small reagent or chemical mixing tank with mechanical stirring device and jet or other pump for introducing reagents into treating tanks, and a filter.

The treating tanks are filled alternately with water; while a tank is filling, the reagents are introduced and thoroughly mixed with the water by means of the mechanical stirring devices, consisting of a specially designed



paddle, revolved by power from an available line shaft, an engine or a motor. The paddle not only mixes the reagents with the water, but at the same time stirs up from the bottom the lime sludge of preceding purification. This sludge floats in the water, hastens the chemical reaction, and causes the new, finely divided precipitate to form large, woolly flakes heavy enough to settle quickly as soon as the water stops moving. This mixing device is one of the simplest and efficient that can be devised. With reasonable care it will not get out of order and it does not have to be cleaned to keep it in working condition, while it requires very little power for its operation.



After a tank is filled the stirring device is stopped and the water permitted to stand, in order to allow the precipitate to settle to the bottom of the tank by means of a hinged floating outlet pipe, arranged to rise and fall with the level of the water, so that the water is always drawn from the top. The water at the top being the clearest, carries the least amount of floating sludge through the floating outlet pipe to the filter beds; therefore, the filters can be run the longest possible time without being cleaned. The rate of flow to the filters is automatically controlled, so that they are supplied with water as fast as it is drawn from them.

While one tank is being filled, treated and settled, the other is supplying treated water, and by the time it is empty the first tank is ready to use. In this way a con-

stant supply of accurately treated, soft, clear water is always on hand.

Pipe connections, through which to fill the tanks and to wash the sludge from the tanks, are placed in the bottom.

The washing of the settling tanks needs to be done only about once a week, or when the sludge becomes so deep as to interfere with the proper mixing. To wash out a tank, it is necessary only to open the valves to the sewer, and start the stirring device to mix up the sludge, which is soft enough to flow through the pipe into any sewer.

In this system it will be noted that every provision is made to take care of any variation in the source of supply, using practically the method for accomplishing results which the dyer uses, so, in a measure, it is the preparation of the water to meet the specific requirements.

The manufacturers of this system also manufacture types of continuous water softening and purifying systems, which, as a rule, they do not recommend for cotton manufacturing establishments in view of the difficulty of obtaining uniformity with variable supplies, and the varying rates at which water is required, using commercial reagents, which are of variable quality.

They are also manufacturers of a full line of mechanical gravity and pressure filter systems to meet the specific requirements of any cotton manufacturer, for a water which will be uniform, clear and free from all objectionable substances for every process, irrespective of what impurities are contained in the water originally at the source of supply.

The success with which apparatus of this discription has met in the various textile operations and the study which experts in these lines have made of the subject, enables them to intelligently handle any proposition that may arise for consideration involving the purification of water for any use.

THE PRINTING OF COTTON FABRICS.

(*Contributed Exclusively to* COTTON.)

BY DR. LOUIS J. MATOS.

The preparation of cotton fabrics for printing requires that they should be well singed and freed as well as possible from all foreign matters, such as warp sizing, oils, stains, etc., and if the goods are bleached before printing, which is very often not the case, no trace of bleaching lime should remain in the goods as its presence may have some influence as shown by uneven shades, especially in bloteh work.

At the present time manufacturers are giving particular attention to the use of sodium hypochlorite solution for bleaching, instead of the old lime bleach, for the reason that goods bleached by the former method always leaves a finer and clearer fabric than where lime bleach is used. It also permits the use of certain colors, particularly of the hydron group which may be printed on gray goods and afterwards bleached without alteration in the shade.

The use of malt preparations has made great advances during the last few years, preparatory to bleaching. These malt preparations have revolutionized the handling of cotton fabrics on account of their activity, concentration, and stability. They contain large quantities of diastase which under simple conditions renders completely soluble any starch that may be present and without acting upon the cellulose. It therefore becomes apparent that the best results in cotton printing may only be obtained upon goods completely freed from all extraneous matters.

Printing of cotton fabrics naturally falls into three broad classes, namely: printing colors directly upon white goods; printing certain chemicals upon white goods and afterwards dyeing with suitable dyestuffs, the chemicals first printed being of such a nature as to prevent the subsequent dyestuff from coloring the parts so printed; and the third broad method and one made considerable use of with many modifications is the so-called discharge method in which the fabric is first dyed in the piece and afterwards printed with one or more white or colored discharges, thereby producing contrasting effects.

Certain so-called styles of printing were formerly very much used, namely, pigment styles, but of recent years, owing to the introduction of the hydrons and other vat colors, these pigment styles have become of minor importance. Under the general name of steam style, a number of processes were understood, and the following will serve as examples. The term "steam style" alludes to the fixing of colors on the fabric after printing, by means of steam applied to the goods while being passed through the steam box in which steam is maintained at a definite pressure, temperature, and degree of humidity.

Prussian blue is a pigment formed directly upon the fabric, and was used formerly quite extensively, and for certain very cheap prints is still used. The "color" is made as follows:

Water 1 gallon.
Oxalic acid ¼ pound.
Powdered alum ¼ pound.
Yellow prussiate of potash 1½ pounds.
British gum thickening 1 gallon.

This color is printed and after printing the goods are allowed to dry without loss of time and then passed through

the steam box, the result being that the prussiate decomposes setting free the blue pigment upon the fibre.

Other colors of a similar nature may also be produced in the same way, for instance, chrome orange, which is compounded as follows:

Barium chromate 50 per cent paste 15 pounds.
Lead nitrate 3 pounds.
Sugar of lead 7½ pounds.
Thickening 5 pounds.

The so-called "extract styles" with mordant colors still find extensive application for certain effects, but their importance is considerably lessened by other processes. This style involves the use of the dyewood extracts, hence the name. The feature of printing these colors is to combine the mordant and the color in the same paste, as follows:

Corn starch 10 pounds.
Tapioca flour 2 pounds.
Acetic acid 1½ gallons.
Logwood liquor, 12 degrees Tw 7 gallons.
Quercitron bark liquor, 12 degrees Tw 1 gallon.
Rancid olive oil 3 pints.

The starch and the flour are made into a paste with the acetic acid and heated, and to the mass is added the other ingredients, boiled well together and cooled, then add Chlorate of potassa ¼ pound and cool further, after which add Acetate of chrome, 32 degrees Tw 2 gallons.

Chromium acetate is much used in cotton printing, especially for the fixation of alizarine and other "chrome" colors, not only upon cotton but upon wool. It is prepared in the following manner: Chrome alum 80 pounds dissolved in 18¾ gallons of hot water to which to added 80 pounds of sugar of lead, the whole being stirred until no lumps remain. Allow to settle and decant the clear solution for use. Other methods are used for preparing this chemical but they offer no advantages over the above.

Basic colors, such as methylene blue, brilliant green, methyl violet, Bismarck brown, etc., are also mordant colors and find wide application in the printing of cheap lines of cotton, where fastness is not the most essential feature. These colors must always be printed with the aid of tannic acid, according to the following general recipe:

Dyestuff 5 to 20 parts.
Acetic acid, 8 degrees Tw 80 to 100 parts.
Acetine 20 parts.
Water 275 to 140 parts.

The whole stirred into 600 parts of thickening 10/J. Then add tartaric acid (1:10) 20 parts and when cold add tannin-acetic acid 1:1 30 to 100 parts. Thickening 10/J is made by boiling 12 parts of wheat starch with 70 parts of water, adding 10 parts Tragacanth thickening and 8 parts of acetic acid 8 degrees Tw.

After printing, the goods are steamed from ½ to 1 hour without pressure and afterwards fixed by running through a bath containing ½ ounce of tartar emetic (or equivalent of antimony salt) and ¼ ounce of chalk per gallon, after which they are washed, soaped, and finished. The after treatment of printed cottons is difficult to describe for the reason that the details in different mills vary considerably.

For the general run of cotton fabrics the diamine or substantive colors find extensive application and cover a very wide range of effects. They are applied directly without the aid of any special agents other than phosphate of soda and glycerine, while for very heavy shades, a very small quantity of caustic soda may be used in the print paste.

The following is a typical printing color:

Diamine dyestuff 4 pounds.
Water 5¼ gallons.
Phosphate of soda 3 pounds.
Glycerine 2 pounds.
Tragacanth thickening, 40 pounds.

As printing with the diamine colors is of great importance, it is well to observe the following notes. Use soft water whenever possible to dissolve the dyestuffs, but if the water is hard, add an ounce of a 9 degree Tw. solution of citrate of ammonia per gallon.

For very heavy shades where more than 3 parts of color per 100 parts of paste are required, it is best to heat the dyestuff solution together twice with the thickening, while some colors are rendered more quickly soluble when in large proportion by adding a small quantity of soap.

The choice of thickeners is one upon which color mixers do not agree. Each has his own preference. The writers choice is always for gum dextrine or gum tragacanth.

Steaming requires from ¾ to 1 hour, and the prints should be steamed in a somewhat damp state, which materially aids in fixing the colors. To attempt complete fixation short of ¾ hour with the direct colors is not successful.

Washing can always be done in cold water, but in washing deep shades, the use of either alum or common salt in the bath is to be recommended, as it guards against the possibility of the colors running.

Certain direct colors are of importance for producing prints of good fastness to light. These colors are diamine sky blue FF, diamine blue 3R, diamine browns B and M, the diamine catechines and diamine orange B. These are printed according to the following recipe, which contains a salt of copper, thus:

Dyestuff 1 part.
Water 26 parts.
Glycerine 5½ parts.
Tragacanth thickening 60 parts.
Alkaline solution of hydroxy-copper (5 percent) 7½ parts.

After printing, the goods are steamed in a damp state, washed lightly and dried.

A peculiar use of the diamine or direct color is in the printing of book binders cloth, not only on account of the solidity of the shade but also from the fact that these colors may be brightened by shading with basic colors, imparting a degree of brightness not normally possessed by them. When diamine and basic colors are mixed together in solution, insoluble lakes are formed, and may be thickened and printed with tragacanth and albumen, and printed in the very thinnest stripes and which will not run during steaming. The following is a typical recipe:

Diamine color 10 parts.
Water 200 parts.
Barium chloride 10 parts.
Water 200 parts.

Dissolve and mix, the barium solution being run into the dyestuff solution, stir, and allow to settle, decant and filter. The color paste is washed twice.

A diamine color lake brightened with a basic color is made as follows:

Dyestuff 10 parts.
Water 200 parts.

Basic color 2½ parts.
Water 100 parts.
Barium chloride 10 parts.
Water 200 parts.

The barium solution is run into the diamine solution, mixed, and then the basic color solution poured in, stirred well, settle, decant, filter, and wash twice.

For printing book binders cloth or similar fabrics, the printing paste is made with:

Color lake as above 30 parts.
Tragacanth thickening (1:10) 48 parts.
Blood albumen solution (1:2) 20 parts.
Soluble oil. 2 parts.

Print, steam 20 minutes at 7 pounds pressure, wash and if necessary soap at 100 degrees F.

The next article will detail the methods for producing mercerized effects notably the so-called crimped styles.

WISHES TO REMOVE THE ODOR.

EDITOR COTTON:

We bleach raw cotton for use in surgical purposes, and conduct the bleaching operations in the usual manner by first boiling out in caustic soda, then chemicing with chloride of lime solution, souring with sulphuric acid, and finally finishing with two kinds of soap, palm oil and so-called pure olive oil soap. We are having more or less trouble with a peculiar odor adhering to the bleached cotton, which is sometimes very much in evidence, and then, again is hardly perceptible. We would like to know the cause of this odor and how to remove it.

ANSWER: The cause of the odor in the bleached cotton referred to by this correspondent is without doubt due to the fatty matters in the soaps employed for softening the fibre after bleaching. Soap made from palm oil is very likely to develop an odor from the rancidity of the oil employed and from certain impurities which are liable to occur in inferior grades of this oil which have not been properly purified. The "so-called pure olive oil soap" which is also employed is also a very questionable substance; if it is really made from actual olive oil, it of course must be obtained from the lower grades of this oil known as "olive oil foots," or the chances are that it contains cotton seed oil in place of more or less of the olive oil. Unless it is a high priced soap it may be reasonably certain that it is not prepared from a good pure grade of olive oil.

Since the material is bleached with chloride of lime, and as the water employed for washing and preparing the various baths is no doubt of considerable hardness, when these soaps are employed there is more or less lime compounds of the fatty acids of the soaps precipitated in the fibre which it is impossible to remove. These compounds, especially if heated too high in the drying operation, or if they become oxidized by exposure to the air, will develop an odor.

It is rather surprising that cotton which is bleached for surgical purposes—that is to say, for the preparation of absorbent cotton—should be softened after bleaching with soaps. This treatment will naturally reduce the absorbent properties of the fibre, owing to the circumstance just mentioned of the soaps forming insoluble greasy lime soaps in the fibre. These compounds will act as water-resisting substances, and considerably lower the absorbent quality of the bleached fibre. Also in bleaching with chloride of lime solutions, especially where sulphuric acid is employed as the sour, it is impossible to eliminate completely the insoluble lime salts from the fibre, and even if soaps were not afterwards used, these salts themselves tend to reduce the quality of the absorbent cotton. In the first place they fill up the pores of the fibres and thus cause loss in absorbent quality, and in the second place they tend to cause the formation of oxycellulose. This substance is an oxidation product of cellulose and gradually develops brittleness and generally a brownish yellow color. Properly bleached cotton should be as pure cellulose as possible, and the presence of any considerable amount of oxycellulose in the fibre is very detrimental in many ways.

One of the largest manufacturers of absorbent cotton in the world has carefully investigated this matter of bleaching, and has for sometime adopted the method of bleaching both his raw cotton and his cotton cloth with liquid chlorine. By this method of bleaching all lime compounds are completely eliminated from the fibre and the danger of the formation of oxycellulose is reduced to a minimum. A good control over the quality of cotton bleached for surgical purposes is to have a chemical analysis made of it, especially with reference to the amount of ash present, as this latter will indicate the amount of lime compounds present. In bleaching with chloride of lime, even under the best conditions, it is not possible to reduce the amount of ash below 0.10 to 0.15 per cent. By bleaching with the liquid chlorine method, however, it is easily possible to obtain bleached cotton showing only 0.02 to 0.05 per cent. of ash. The percentage of ash present in cotton bleached for surgical purposes is a very important factor, as it not only indicates the purity of the cellulose and its consequent degree of absorptivity, but it also indicates the probable degree of oxidation of the fibre and the consequent liability to the formation of oxycellulose.

It is presumed that the use of the soaps mentioned by the present correspondent in connection with the bleaching of the surgical cotton is for the purpose of softening the fibre. This indicates the fact that he is bleaching his fibre too harshly in the first place. By the use of liquid chlorine in connection with this class of material, it will be found that a much softer bleach is obtained, and then it will not be necessary to use any soap or softening compound on the bleached fibre, thus reducing both the cost of the bleaching and the liability of the material developing an objectionable odor.

Imitation Wool from Ramie.

A recent French patent describes the following process for preparing imitation wool from ramie: 100 kilos. of stripped ramie are cut into lengths of 30 to 80 mm. and boiled for 2 hours in 1000 litres of a 2½ per cent solution of sodium carbonate. The liquor is then run off and the material is again boiled for 6 hours in 1000 litres of water to which has been added 20 litres of caustic soda of 36 degrees Be. After draining and washing thoroughly with cold water the scoured fibre is hydro extracted, dried, opened and next curled by working it for one hour in a cold bath containing 1000 litres of water and 1000 litres of caustic soda of 36 degrees Be. The excess of the solution is then pressed from the wet fibre and the process is completed by the operations of souring, washing, drying and carding.

Practical Problems Discussed by Cotton's Readers.

We invite our readers to make use of this department for the discussion of any and all problems arising in the mill or the finishing plant. Questions, answers or letters need not conform to any particular style and will be properly edited before publishing. The editors do not hold themselves responsible for any statements of opinion or fact which may appear in this department unless so indorsed. This department is open to all.

COMMENTS ON THE HELP QUESTION.

BY W. B. W.

EDITOR COTTON:

I have been very much interested in the articles which appeared in the last two issues of COTTON; also one which was published three or four months ago on the topic of the labor question. In the article of two months ago, the writer classified the help and knocked the French. In my opinion, he did a very unwise thing in so doing, not only because he showed that he was prejudiced against the French, but also, because a man in his position is supposed to be trained to use all classes alike if he wants to secceed in the mill business. An overseer who hires, or who refuses to hire, a hand simply because he is of a certain nationality or religion will never be a success as an overseer and might as well give it up now as later.

I once kept a book on help, and when he or she left, I entered his or her name in the index, and then wrote an elaborate account of the qualifications, or disqualifications as the case happened to be, of the hand, and if they ever appeared again the book was consulted and if they did not stand good, they were not hired. I soon discovered, however, that I was losing good help by so doing and that other mill overseers were the gainers, so it did not take me long to discard the ledger. Now, if I discharge a hand, I call the account square and am ready to start new, and I find that some of the help on second trial turn out to be some of the best.

I know an overseer in a mill in this town who was very outspoken about the French, and now his room, in consequence of his talk, (in the winter time), is the shortest of help of any of the mills in this vicinity. I want to be understood as not defending the French help in particular, but all classes, as classes. The old idea of help working for you has gone by, in this vicinity at least, and now to get the best out of them you have got to have the help work *with* you, and it does not make any difference what nationality or religion they are, you have all got to pull together.

Take it in the summer time for example, if the work is running bad, the weather sticky and disagreeable, and everything seems to go wrong, how much better it is for the overseer to take off his collar and tie, roll up his sleeves, and do a little sweating himself by giving them a hand when they are getting "owly," than it is to have a hand "up to his neck" in bad work and looking towards the office, see the boss reading a paper, his feet up on the desk, and an electric fan blowing gentle zephyrs on his bald spot. Can you blame them for jacking up when they are so reminded of the fat envelope he gets as compared with the one they get? But, on the other hand, when the boss plugs as hard as they do, or makes them think he does, they don't think of envelopes but will say that the boss is just as much concerned about the running of the work as they are.

Now, about the other article of three or four months ago, the writer asks why the young man of today does not go into the mills. The young man of yesterday, speaking metaphorically, who wished to enter the mills, did so with the knowledge that he would have to work and work hard, but he knew if he did so, he would sooner or later attract the attention of the men higher up and then he would be made, because the mill owners and managers of yesterday were on the lookout for material in men and encouraged the young man when they found one worthy. But now a young man who has been in the mills, say for five years or more and has plugged hard and had his eyes on an overseer's or superintendents job, has the vim taken out of him when he sees a position become vacant, which he knows he can fill, and then sees it passed over to some young man of twenty who has just come out of a textile school, simply because he happens to be some ones nephew or other relative. This young man can figure a mill from top to bottom perhaps; the other can figure his room and perhaps some of the others, but in the running of the mill, the practical young man is the one who will have to do it.

I have had a man who owns a large amount of stock in the local mills say to me, in speaking of the mill business, "If a young man is smart and capable, he will land a superintendents position some day, because the mill agents are always looking for smart men in their business." That is the way it should be, and probably is, somewhere, but how many times you have seen the position of agent filled by some one, who never worked a day in his life, neither in the mill nor in the mill office, simply because the "powers" said he must have a job.

Is it any inducement for the young man of today to enter a mill office, and spend twenty-five years, the best twenty-five years of his life, "plugging" and then see some rank outsider step over his head when he knows, that for the first year at least, he will have to carry the new man on his back or get out? When these things are straightened out, and a man is taken at his worth, then will the desirable young man, the man without pull, but with plenty of push, enter the cotton mill. All he asks is a square deal, and an equal chance for every one which he does not get today.

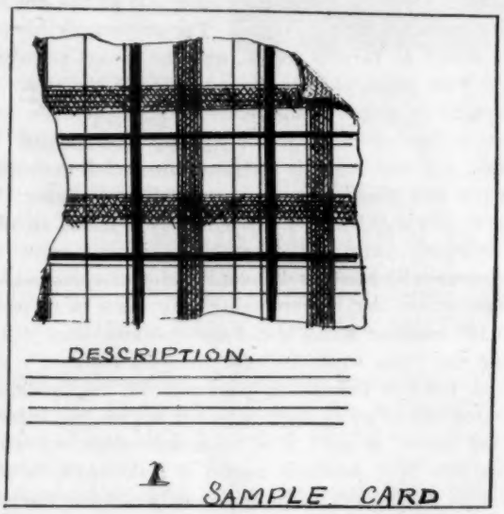
There is a textile school, not a hundred miles from this town and I remember the last graduation as it was reported in the local paper. One paper said that as long as these young men had graduated, and had got diplomas, they thought that the mill agents and superintendents, should give these young men the first chance as superintendents and overseers and see what they could do, as some of them had put in two or three years studying and ought to know something. I wondered if the reporter who wrote up the same would like to go to sea with a captain who had got all his knowledge at a nautical school, and I wonder now

what would become of us, who worked in the mills before textile schools were established?

THE ADVENT OF A BUSINESS MAN.

BY GEORGE RICE.

Sometimes a man with business capacity is able to accomplish more practicable and profitable results with a manufacturing plant than a man who is an experienced manufacturer. Not long since a certain cloth manufacturing plant was operated by a superintendent who was well qualified from a technical standpoint to manage the same. He understood the details of the fiber construction from the bale to the finished texture. He was a competent steam engineer and understood how to get the best results from the power system of the mill. He could design new patterns of texture and improve upon old ones. He knew just how to figure on the yarns to get the proper weight in the finished goods. He could handle the operatives as well as the average manager of a body of mixed help. In fact he

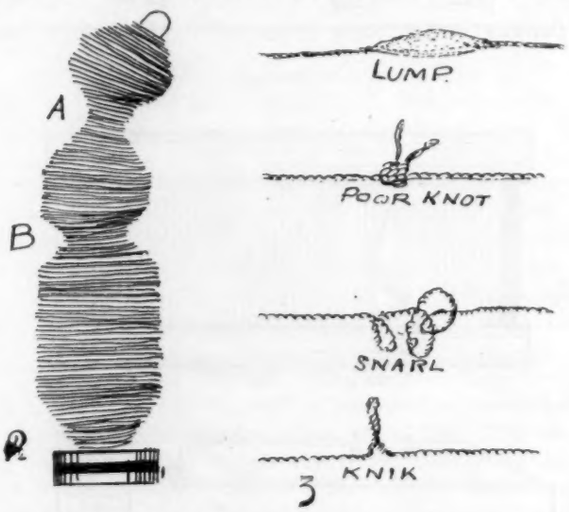


seemed to be about the right man in the right place. But the mill failed to pay the proper dividends to the stockholders. The latter were constantly complaining. While the finished goods had a standing in the markets, and at the same time sold well, the profit and loss ledgers seldom presented a favorable showing for the stockholders at the end of each quarter.

Finally one of the members of the board of directors chosen by the stockholders undertook to run the mill. He knew little about fibers and fabrics. He was not familiar with the different kinds of dyes. He never had had any training in steam engineering; but he knew that he could hire a trained engineer and plenty of firemen. He was not a designer, but he realized that for a nominal salary he could get plenty of graduates from schools of design. He did not know how to repair a broken down loom or spinning frame, but he was able to hire machinists of ability at reasonable wages who could keep the machinery in perfect running order. Therefore this business man went at the undertaking from the point of view of one who would push a failure to success through pure business methods.

First he examined carefully the methods of the operatives. He found that waste of time and waste of stock existed in every department. He established a checking system for time, and every operative was registered in and registered out, so that in a little while the product of the plant took a leap forward without any increase in the cost for labor. Up in the office this manager set the assistant superintendent to work getting out sample cards. Heretofore the assistant superintendent was a figurehead who walked through the works daily and reported anything out of the ordinary to the chief superintendent and the chief took action if he thought fit. The business man could not see the worth of this, and he gave the assistant a real job and the assistant turned out some good sample cards of the order shown in figure 1 with description of the samples written in pen and ink along the blank lines indicated. Then the sample was pasted on and these samples were sent out over the country, resulting in orders being obtained from dealers. Formerly the superintendent had not given any attention to the sale of the goods as the commission houses took the whole product in bulk. But the margin of profit was exceedingly small under such conditions and the stockholders failed to derive much benefit therefrom. With the new system of disposing of the goods, the profits were larger.

The new manager did not know how very much about waste and saving of waste in the manufacturing departments, so he utilized the services of the superintendent to check the waste. The superintendent was under contract with the mill and he could not be discharged. Besides, he was an able man so far as general superintending of the mill was concerned, but he did not know how to make



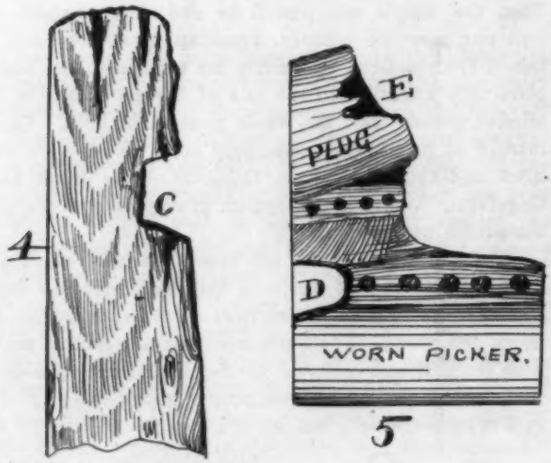
money and money is what the owners always want. They had rather get dividends than see machinery running perfectly.

The new manager detected waste in the form of uneven bobbins of yarns as in figure 2. The spinners were at fault. The faller wires did not guide the spun strand to the low places at A and B because the careless spinners allowed the roving to break off. The new manager stopped this by fining the spinners for bad bobbins. He also stopped bad work in the spooling and warping department by fining the operatives. There were lumps, poor knots, snarls, kinks, etc., as shown in figure 3, due to improper work in the departments, and the new manager put a check on this sort of thing.

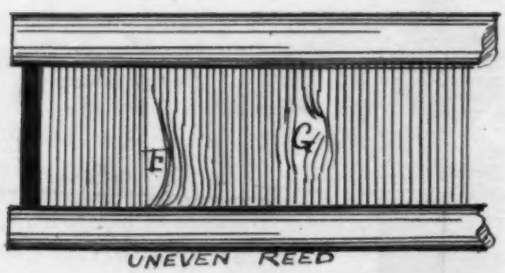
The new manager used the superintendent as an inspector in the department of weaving, where some of the looms

were running badly and making imperfect goods due to the defective picker sticks, as some of the sticks were worn down at the head by the raw hide pickers as at c figure 4. Some of the rawhide pickers were broken at the plugs as at E and worn by the stick at D as in figure 5. Reeds in the looms made streaks in the goods due to the bent splits as at f and g figure 6. Waste was cast about the floor and stepped upon. All of this the new manager stopped. He had partitioned waste boxes made and in these boxes the help put the soft waste to stop the same from being trodden on.

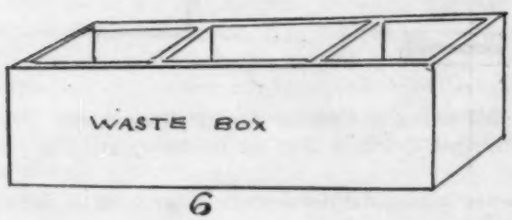
In this way the business man went through the various



DEFECTIVE PICKER STICK.



UNEVEN REED



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departments of manufacture. He pushed the sale of the goods. He saw that the help got to work on time and did not quit work until the proper hour. He saw to it that the waste item was remedied. He prevented defective goods by having the looms properly operated. The streaky fabrics were stopped when the reeds were fixed. Waste which had been mixed in any old way was kept assorted and clean. Consequently the new manager had that mill on a paying basis before the end of another quarter and a liberal dividend was declared. It illustrates that the possibilities of the active business man are many, even though he may not be qualified as an engineer or a loom boss.

SCIENCE AND COTTON CLOTH MAKING.

BY J. R.

To some, the improvements that have taken place in the making of cotton cloth during the past hundred years seems very great, but if we compare them with the improvements on the steam engine, we will find the former comparatively small. The reason for this is, that the principles of the steam engine are better understood than are the principles of cotton cloth making. Why this is so, can easily be understood, when we remember, that the steam engine has been an object of deep study for scientific men, whilst on the other hand, cotton cloth making has been little noticed by men of science, and has been left, almost wholly in the hands of those who have had but little scientific training.

In steam engineering, it is well known how much power there is in a pound of coal, and how much of this power is lost between the time of the coals being put on the fire and its being given off by the engine. The amount of this loss can be traced at various stages, and the causes accounted for; but with cotton cloth making, this is not the case. To one engaged in cotton manufacture does the question ever arise as to how much power is consumed in working the machines, and how much is consumed in useful work?

To put this question more clearly. I will assume that one horse power will run one hundred ring frame spindles when spinning yarn, but when not spinning yarn, one horse power will run one hundred and two spindles. In this case, we see that we are using fifty times more power to run the machine which is not our purpose, than it does to make the yarn, which is what we wish to do.

If we were to follow this plan with all the operations that cotton has to go through before it reaches the spinner, and then follow it until it is made into cloth, we would soon see how little power is needed to make cloth, as compared with the amount of power used to run the machines employed in making the cloth.

There is very little scientific knowledge among cotton manufacturers regarding the mechanics of the process, though, there is a fair knowledge of the science of cloth construction. For instance, it is known that ordinary spun yarn is but a little over twenty per cent of its theoretical strength. Bowman and others, have done good work in this line.

If the mechanics of cloth making were better, understood it would not be long before much better methods for this purpose would be invented, as inventors would be better equipped for their work.

More can be said on this subject and I earnestly request all readers of COTTON to discuss it at greater length and detail.

Robert P. Dempster, a graduate of the Knoxville, Tenn., High School, has just completed a course of study at the Philadelphia Textile School, and accepted a position as assistant designer at the Aberfoyle Mills Co., Chester, Pa. Mr. Dempster's employment by this company is another sign of the recognition among progressive textile mill managements that trained textile men are a greater necessity than ever in the conducting of the various mill departments.

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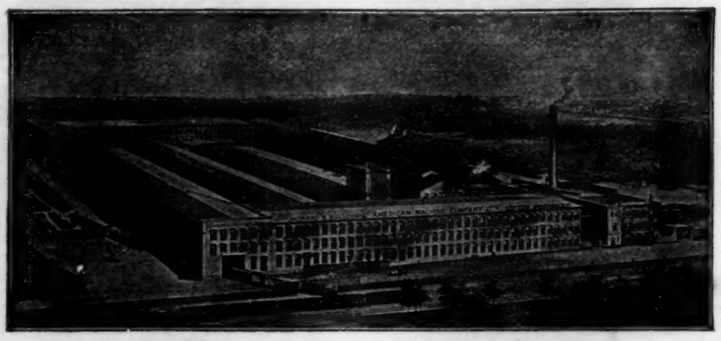

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WE INVITE YOUR INVESTIGATION AND COMPARISON

THE ALBANY COTTON MILLS.

One of the neatest and most compact small cotton mills designed by Lockwood, Greene & Co., is the plant of the Albany Cotton Mills, located at Albany, Ga. The present installation comprises 10,752 spindles which will be run on standard sheetings. The plant includes a 3-story main mill, an engine room, boiler house, a storehouse, a reservoir, and an office building.

The main mill is 183 feet long by 130 feet wide. It is divided into two sections by the ropeway which opens directly into the engine room located at the rear of the main mill. This ropeway, which is separated by brick walls from the other parts of the mill, also contains a dust flue, an elevator, and the stairs.

In the spinning room in one section of the top story alternate columns are omitted and the intermediate roof beams are carried by longitudinal girders capping each line of columns. The windows are very liberal in area, extending from pilaster to pilaster, giving excellent facilities for the entire width of the mill.

As mentioned above, the engine room adjoins the main mill on the rear ,the 12 foot ropeway connecting directly with the engine room. The latter is 46 feet wide with trusses supporting the roof across this space. There is a basement under the engine room 12 feet 8 inches high in which is located all the auxiliary machinery. There is a clear height in the engine room itself of 23 feet from the finished floor to the underside of the trusses. The plant is equipped with mechanical drive, the main engine driving by rope drive to the main shaft on each floor.

The entire power equipment was installed by the C. & G. Cooper Co., of Mt. Vernon, Ohio. This includes three horizontal water tube boilers, of 250 H. P. each, an economizer, an automatic damper regulator, two boiler feed pumps, a thousand gallon fire pump, a horizontal steam driven jet condenser, a 1000 H. P. feed water heater, a No. 10 Koerting injector, a 75 K. W. lighting unit, and a main engine of 1500 H. P. The latter is of horizontal cross compound type with 26 and 52 inch cylinders, and 48-inch stroke, running at 80 to 90 R. P. M., with 180 pounds steam pressure and 26-inch vacuum.

The boiler room adjoins the engine room immediately behind same, and is designed to accommodate six boilers, three of which are installed at the present time. The roof is supported by steel trusses with a clear span of 46 feet, and there is a skylight monitor which makes the boiler room both light and airy. The floor of the boiler room is on a level with the floor of the engine room basement.

Jast back of the boiler house there is a railroad spur and beyond this a cotton storehouse, with a loading platform extending its entire length alongside the railroad track. The storehouse is one story, of standard mill construction 102 feet long by 150 feet wide, and is divided into three 50 feet sections. Back of the storehouse is a 2½ million gallon reservoir 8 feet deep. At some distance in front of the main mill is a 1½ story frame office building of handsome design, with porch around three sides, and a red tiled roof.

Inquiries about anything pertaining to the textile industries will be cheerfully answered by COTTON.

THE CARE OF BELTS AND PULLEYS.

BY GEORGE RICE.

The idle wheel is always more or less bother to power and transmission engineers and mechanics. It is the one that often gets hot and makes you do things in a hurry to prevent the bushing of the wheel getting burned out. The idle wheel is the wheel that wrecks many good belts in the course of a year, providing that the wheel has not been adjusted right, or if the wheel tilts out of alignment as in Fig. 1. Here we get a model of the fast and the loose pulley on the shaft with the loose wheel worn out

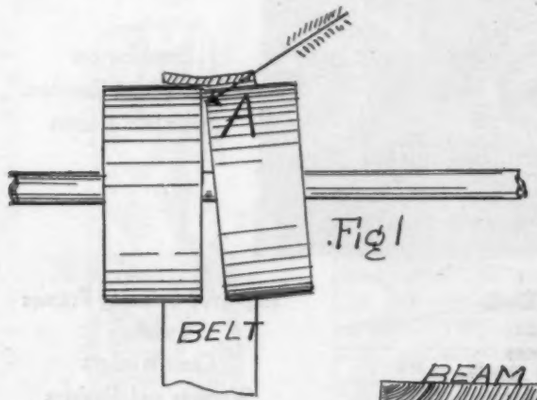


Fig 1

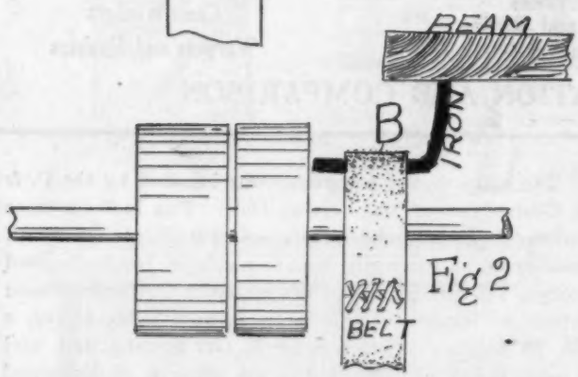


Fig 2

of line at the hub to the extent of making the wheel draw over to one side. The inner side of the wheel droops down and there is quite a depression prevailing at the juncture of the two revolving wheel surfaces at A. Consequently the belt has to labor to slide from one wheel to the other. The edge of the upright wheel has to be mounted every time the belt is shifted from the tight to the free pulley or back again. In time the edge of the belt becomes worn and defective and a new belt has to be substituted.

In order to avoid the wearing of the hub of the free wheel, many men slip the belt off the pulley when it is not needed. This is a good plan. To let the idle wheel run day after day for months, as some men do, whether used or not, results in the unnecessary wearing off of the metal in the hub bearing and the wheel soon gets disordered. But it is not safe to let the belt go flapping on the revolving shaft and it is not necessary that the belt should be thrown off the loose wheel and allowed to run on the shaft. The belt can be shifted off from the loose pulley on to a metal arm as at B, Fig. 2. In case the power is not needed all day, or for a number of days at the time, it is far better to drop the belt off from the loose wheel onto an arm like this, and let the wheel stand idle and prevent wear. You can put up a bent hook like this by driving it into a bored hole in a nearby wooden beam. Or a completely wooden frame can be made to catch the belt.

The men in some places are a little careless in this respect. Instead of going to the trouble of arranging a metal bar, or a wooden frame to retain the belt, they simply cast off the belt and let the belt run free on the line of shafting. This is dangerous. If the shaft happens to be rusty or gummy, the belt may double over on it, and tear the hangers down. Belts are strong, as a rule, and owing to the swiftness with which the belt might double on the shaft, the results would be exceedingly disastrous to the system. Fig. 4 illustrates another way in which one can arrange for the disposition of the idle wheel problem.

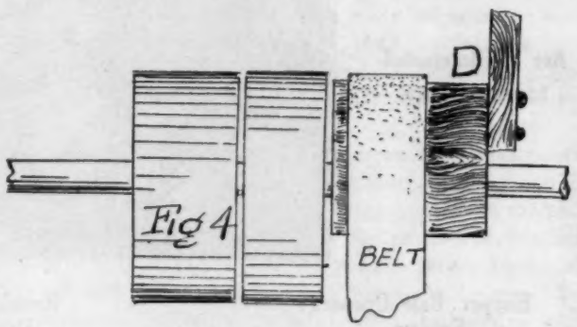


Fig 4

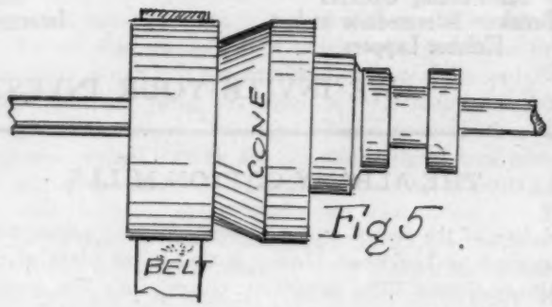


Fig 5

Instead of knocking the belt off to the shaft, or on to a single rod or wooden frame, the belt is slipped over from the idle wheel onto a wooden or sheet metal form arranged as at D. The form is made about the same shape as the wheels. It is secured at the same level and therefore the belt can be slipped from one to the other system very readily.

Fig. 5 shows the system of cone wheel which is found in use in some shops. The cone is arranged on the clutch or frictional plan. You have to have your belt on the idle wheel in this case, as shown. In order to relieve the idle wheel, when the system is not needed, you can rig up a rod, a wooden arm or a form as in Fig. 4, to support the belt while off the wheel, thereby saving the wheel bearing just that much, besides giving the belt a rest. The laces in the belt pull open when the belt is under strain all the time. The fiber in the leather also stretches. The belt will last much longer and give better service if allowed to remain off the wheels even over night. Your idle wheel with its belt is much like the idle wheel of any driving system and can be treated the same, so far as the supporting of the loose belt is concerned, when the belt is off from the idle pulley.

Inquiries about anything pertaining to the textile industries will be cheerfully answered by COTTON.

Barrett Specification Roofs

Rutan & Russell Architects.

E. J. Thompson Co., Garage Pittsburgh, Penn.

The Choice of First-Class Architects

THE better the building, the more certain that it will have a Barrett Specification Roof, because first-class buildings are the work of first-class architects and engineers, and they know the relative values of the different types of roofing.

They know that a Barrett Specification Roof consists of five layers of Specification Felt cemented together with continuous layers of Specification Pitch, with a top surface of slag or gravel. It is built on the roof without the narrow joints or laps like tin or ready roofings.

They know that a Barrett Specification Roof is a substantial, fire resistant roof, accepted at base rates by insurance underwriters,

They know further that its cost is less than that of any other permanent roofing and that its maintenance cost is nothing, making a net cost per foot per year of service, of about 1-4 of a cent.

The Pittsburgh garage, illustrated herewith, is an excellent example of modern fireproof concrete construction. Such buildings as this one are almost invariably covered with Barrett Specification Roofs.

A copy of the Barrett Specification will be sent, on request, to any Architect, Engineer or Property Owner. It formulates a precise and practical way of laying these roofs to secure the best results at the least expense. Address our nearest office.

Tar-Rok Sub Floors

Floors of this character have been extensively used for over twenty years and are especially recommended in factories, machine shops, store houses, etc.

COST—They cost less than piers and heavy timbers and extra excavation necessary to provide required air space beneath.

RIGID—They provide for absolute ridigity. No vibration is possible, regardless of character of machinery.

STRENGTH—The load they will sustain is limited only by the earth underneath.

DECAY—They protect absolutely against decay from ground dampness,

ADAPTABILITY—They are suited for any heavy construction where wooden wearing surface is desired.

Special Note

We advise incorporating in plans the full wording of the Barrett Specification, in order to avoid any misunderstanding.

If any abbreviated form is desired, however, the following is suggested:

ROOFING—Shall be a Barrett Specification Roof laid as directed in printed Specification, revised August 15, 1911, using the materials specified, and subject to the inspection requirement.

BARRETT MANUFACTURING COMPANY

New York Chicago Philadelphia Boston St. Louis Cleveland Pittsburgh
Cincinnati Kansas City Minneapolis New Orleans Seattle London, Eng.
The Paterson Mfg. Co., Ltd.:—Montreal, Toronto, Winnipeg, Vancouver, St. John, N. B. Halifax, N.S.

TRADE B MARK

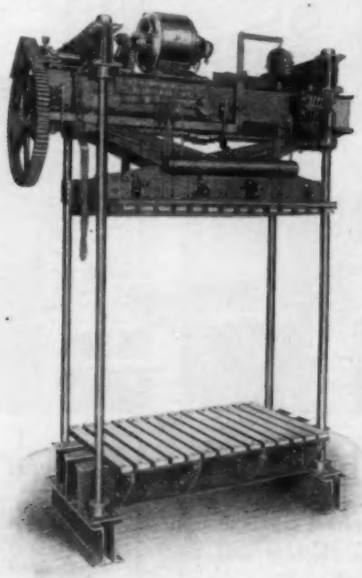
NEW MACHINERY AND TRADE NOTES.

A MOTOR-DRIVEN BALING PRESS.

We illustrate herewith an improved, motor driven direct connected baling press. The important advantages of this equipment are in the saving of motive power, floor space, and time in operation. The manufacturers guarantee that only one-third the power is consumed over any other system.

The machine here shown, operates with a stationary screw toggle lever system, controlled by gears, to which the motor is direct connected, dispensing with belt or chain drive, the latter of which is especially dangerous to operatives on the old style knuckle joint presses.

Not only is this machine extremely rapid, but so little motive power is consumed, that the cost in this regard is



trifling. The machine is as nearly fool-proof as is possible to build, the power mechanism stopping automatically at both its highest and lowest positions, besides being protected against any overload.

The manufacturers, LOGEMANN BROTHERS CO., Milwaukee, Wis., manufacture a complete line of baling presses, operated by hand, belt, electric or hydraulic power. Detailed information will be given upon request by the home office of the company.

During the week beginning September 24th, there will be held at the Grand Central Palace in New York City, in connection with the Rubber Exposition, the Third International Rubber Conference. These meetings will be attended by foreign and American manufacturers of mechanical rubber goods, and by chemists and engineers.

Among the topics which will be brought forward for discussion may be mentioned: Specifications for textile fabrics, used in the manufacture of mechanical rubber goods, specifications for steam-packings, steam-hose and other hose used by engineers in industrial plants, specifications for rubber belting; and efficiency in rubber works.

A cordial invitation is extended to engineers and chemists who may be interested in these topics from the consumers standpoint, to attend these sessions of the conference. Persons desiring to attend the meetings, take part in the discussions or present an original paper on a related topic are requested to communicate with the Honorary Secretary of the conference. Dr. Frederic Dannerth, New Grand Central Palace, New York City.

The following unsolicited letter to the manufacturers of the Northrop loom is printed by permission. It shows what can be accomplished in a mill which is not hampered by traditions.

Great Falls, S. C., March 5, 1912.

Mr. George A. Draper, Treas.,
Draper Co., Hopedale, Mass.

DEAR MR. DRAPER:

"We have no doubt in our minds but that you are thoroughly convinced that you have a great loom in the Draper loom, and we are willing to testify to the fact ourselves, and for this reason we felt that it would be of interest to you to know what we are doing at the Republic Cotton Mills with the Draper loom. For the past eight months we have been manufacturing exclusively 64/64 print cloths; weight 5.15; width 38½. Our looms run at a speed of 157 picks per minute. During this period of eight months our loom efficiency has averaged 112 per cent. We have averaged .9816 per cent Firsts, and we have a reputation established for our goods with the best Eastern Converting trade that is second to none. In fact, we get the preference right along, and the best buyers prefer our goods. We mention this to show you that we are not sending out Seconds for Firsts.

"We have, as you know, 600 looms and our total number of weavers running these looms are twenty-three, an average of twenty-six looms to the weaver. We have *two weavers* in our employ running *forty looms each*. We have no trouble of any kind and our work is running beautifully. We have no trouble securing the best weavers in the country, as our work runs so well they are anxious to get a job with us.

"It is too early to figure what our supplies will be per loom, but it has been so far a very insignificant item. This report is very gratifying to us, and we felt that it would be equally so to you.

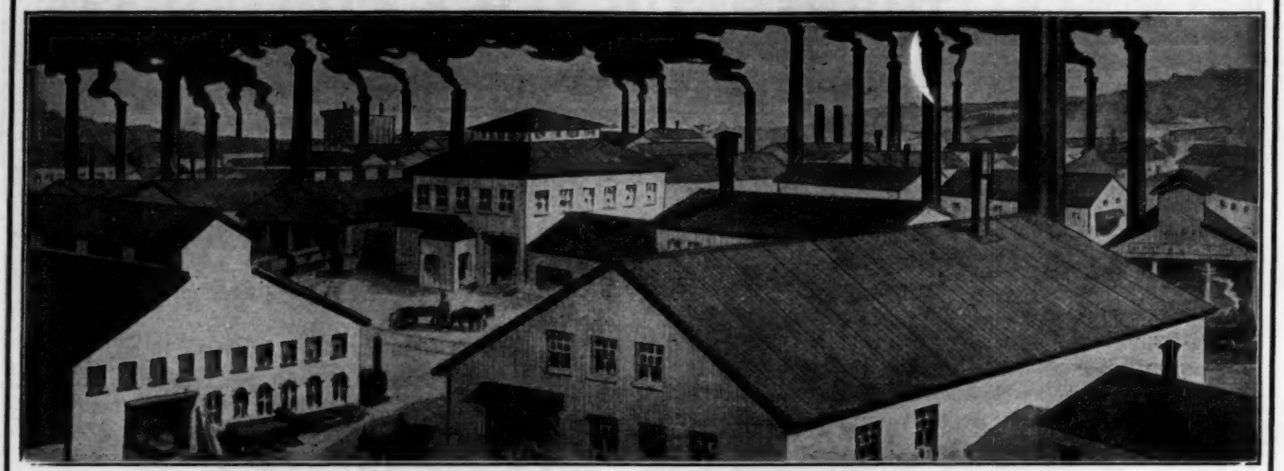
With kind regards and best wishes, we beg to remain,

Yours very truly,
REPUBLIC COTTON MILLS,
Robert S. Mebane, President.

[NOTE.—The italics are ours.—Ed.]

The Farbenfabriken of Elberfeld Co., 117 Hudson Sts., New York are sending to the trade the following color cards: Tannin Indigo Blue B; Para Scarlet 6 B. Extra; Chrome Yellow R. O.; Chromoxane Brown R.; Benzo Rubine H. W.; Algole Brown R. Paste; and Benzo Fast Brown 3 G. L.

For cotton, worsteds and unions, THE ARABOL MFG. CO., 100 William St., New York City, recommend highly their European finish No. 7. It gives excellent results in the padding machine, giving an exceptionally full feel. It is odorless and far superior to glue.



THERE ARE OVER 300 IMITATIONS OF

RU-BER-OID ROOFING

Some of these imitations look like RU-BER-OID, but that is merely on the surface. The roofing buyer cannot see what is underneath, or he would not be fooled into buying the goods on their appearances only.

As a house built on a poor foundation cannot last, neither can a roofing founded on poor material give the service expected of it.

Take none but the genuine

RU-BER-OID

Accent on the "RU" and always spelled with one "B"

Unless the RU-BER-OID Man is shown on the outside wrapper, the roofing is not the genuine RU-BER-OID

KA-LOR-OID
(Colored Ruberoid)
ROOFING

RED—BROWN—GREEN

The only permanently colored prepared roofing.

The ideal roofing for Bungalows, Cottages—in fact suitable for any building where artistic effect is desired.

The Standard Paint Company,

100 William Street, NEW YORK

BOSTON PHILADELPHIA CHICAGO
DENVER DALLAS

TURNER, TUCKER & CO.

Successors to A. B. Turner & Co. and Philip M. Tucker.

INVESTMENT SECURITIES.

MANUFACTURING CO. SHARES. MILL STOCKS. 24 Milk St., Boston. 111 Broadway, New York.

TRANSFER TRUCKS.

Trucks for handling the finished product in both cotton mills and finishing plants, particularly before the product is baled, or cased, have been in use for many years. However, the methods adopted for handling cloth in pieces and rolls on these trucks have been comparatively crude. Today, every means whereby the cost of production can be reduced is looked after with care by the progressive manufacturer. He realizes that every handling increases the cost and also has a tendency to damage the article, therefore increasing the percentage of waste and indirectly increasing the cost.

The transfer trucks designed and manufactured by the GEORGE P. CLARK CO., of Windsor Locks, Conn., are made to meet the demand of those who manufacture goods in which the labor and loss in handling can be greatly reduced. They are constructed in the very best manner, every detail being considered and the friction of the moving parts reduced to a minimum. The general idea of these trucks is to use separate movable platforms which may be placed by the machine or elsewhere and on which the cloth or other commodity may be piled to the amount desired. When necessary to move this cloth to some other department, the transfer truck is slipped beneath the platform and the handle brought down which immediately operates the rising mechanism, thereby clearing the legs or skids of the platform from the floor. While in this position the wheels of the transfer truck make it an easy matter for the cloth to be rolled to any department desired as on the ordinary truck, whereupon the platform is again allowed to come down to the floor and the transfer truck drawn from beneath it. In this way one transfer truck may answer for any number of platforms. These trucks are manufactured in many styles. Ask for bulletin No. L.

MANUFACTURE OF SOFTENERS.

The manufacture of soaps, softeners and sizings for the textile industry requires not only technical knowledge of chemistry but also a practical experience in dyeing, bleaching and finishing. Alfonse Rossmair, who has had years of practical experience in well known Munich, Germany textile establishmets, came to the United States to introduce his special softeners and sizings.

Under the name of the PENNSYLVANIA OIL, SOAP & CHEMICAL CO., Mr. Rossmair has located his factory at 15th and Oakdale Streets, Philadelphia where he is manufacturing specialties for the textile finishing trade, under his personal supervision The many friends of Mrs. Rossmair in the textile trade will undoubtedly be pleased to learn that she is associated in the business with her husband and will continue to call upon the trade.

ONE KIND OF WASTE.

Isn't it true that the biggest leaks in your business are those that go on day by day, unseen, under your very eyes?

It's the little leaks that seem too small to bother with yet in the aggregate they are absolutely startling.

In no place is this truer than with loom equipment; right on the frame itself. For instance: there is a "never-ending" wear upon your harness due to constant friction of the warp thread, and when this friction is working upon such soft pliable stuff as twisted wire or cotton harness; the harness is bound to give way.

Then you go ahead renewing this harness in parts or renewing the whole frame. Here you consume time, labor and material. You are doing this day after day, year after year, while it isn't necessary to do it all.

You keep on spending your profits to keep your frames working up to the highest efficiency.

You permit your operators to spend part of their time and expend labor in the daily repair of harness.

There is a way to end all this labor and cost and bother. Just send a post card to the STEEL HEDDLE MANUFACTURING CO., 2110 West Allegheny Ave., Philadelphia, Pa., and ask for information and samples.

THE AMERICAN TEXTILE DIRECTORY AND YARN TRADE INDEX FOR 1912-13, 690 pages. Published by the Lord & Nagle Company, 144 Congress St. Boston, Mass. Price; office edition, $3.00. Travelers edition, $2.00.

This well known directory is issued annually in July and is almost too well known to need further comment. It contains a full list of the textile establishments of the United States ,arranged by states and towns where they are located and with full data about each mill; also a list of the textile establishments of Canada and Mexico. The yarn trade index is a very complete one as are also the indexes of yarn dealers, commission merchants and agents; bleaching, dyeing and printing establishments; dealers in raw material; manufacturers selling agents, dry goods commission houses, etc. There is also a classified list of mills according to goods made, which is a very convenient index to have at hand on certain occasions. This is an invaluable work of reference which finds a useful place on the desk of every manufacturer.

The General Electric Co., has donated to the Dyeing Department at the North Carolina A. & M. College, one of their patented color matching electric lights, which will be used for research work in the theory and practice of mixing and matching colors. This department is also cooperating with the forest service of the U. S. Department of Agriculture in the investigation of the dyeing properties of osage orange wood. The department gives ample scope for students to undertake research work and to keep in touch with modern methods and developments.

ARE YOU USING "AMERICAN ANILINE COLORS"?

If not, you had better send us an inquiry. It will be of benefit to you. We manufacture a full line of Aniline Colors for Textiles.

SCHOELLKOPF, HARTFORD & HANNA COMPANY, Buffalo, N. Y.

Selling Agents:—NATIONAL ANILINE & CHEMICAL CO.

New York	Boston	Philadelphia	Chicago
Milwaukee	Minneapolis	Cincinnati	Buffalo
Kansas City	Hartford	Providence	

ANTIMONY LACTATE.

¶ As has been widely noted there has been a very sharp advance in the price of Antimony Oxide. Without dilating on the cause of this advance it is of especial importance to users of Antimony products as mordants because they too, will doubtless advance. In the average Antimony product used for mordanting only a comparatively small percentage of the Antimony Oxide it contains is available, the rest is lost, because of the excessive acidity of the bath.

¶ All the Antimony Oxide in ANTIMONY LACTATE is available, hence it is particularly the mordant to use with an advancing Antimony Oxide market.

AVERY CHEMICAL CO., 88 Broad St., BOSTON.

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

ALABAMA.

EUFAULA. Local business men are making an effort to secure for Eufaula the new $600,000 cotton mill that is to be built and operated by a former governor, B. B. Comer, and business assosiates.

GEORGIA.

LAGRANGE. Several of the mills around LaGrange are to erect a commodious building to be used as an auditorium and union church for the operatives of their plants. The structure will be located in the vicinity of three of the mills and will be of handsome design.

ROME. It is reported that an involuntary petition in bankruptcy has been filed against the Cherokee Hosiery Mills. John W. Graham, the receiver, is now operating th plant.

DALTON. It is locally rumored that the Crown Cotton Mills of this place together with a number of Dalton and other capitalists, are buying considerable land at Phelps, five miles from here, and contemplate the erection of a large cotton mill and modern buildings at that sight. The location is an ideal one, being near two trunk railroad lines.

ATLANTA. The American Tape Co. has been incorporated to manufacture tape and other textile specialties. The capital stock is $25,000.

NEWNAN. The McIntosh Mills have completed plans for installing new electrical apparatus. Power is to be obtained from the Columbus Power Co. for operating the 17 new motors which will be used to drive their spindles. Three 200 and two 15 K. V. A. transformers and a switchboard are included in the equipment. The apparatus will be furnished by the General Electric Co.

MASSACHUSETTS.

LOWELL. The Hamilton Mfg. Co. of this city is contemplating the erection of two large additions to its plant. The plans call for a new six story mill 700 feet long and an addition to the recent 268 foot mill.

NEW YORK.

NEW YORK. The Trion Company has been incorporated with a capital stock of $900,000 to take over the Trion .Georgia) Manufacturing Co., operating something over 51,000 ring spindles and 1,400 looms. Albert G. Thorne of 32 Nassau St., and associates, are behind the movement.

NORTH CAROLINA.

SANFORD. The Sanford Cotton Mills are to add 15,000 spindles with the accompanying preparatory machinery. At a recent directors meeting the company's semi-annual profits were appropriated for this new machinery.

HIGH POINT. The citizens of Trinity at a recent meeting subscribed some $15,000 for the purchase of 20 acres of land lying to the southwest of the Trinity depot and donated to the High Point Consolidated Mills Co. of this city, who will erect a large spinning and twisting cotton mill on the site. It is also reported that the company expects to build a large number of tenement houses in the vicinity for the employees who will operate the mill. It is expected that the North Carolina Public Service Co. will extend their electric car line to Trinity in the near future, thus completing the linking of the two places together with the hamlet of Archdale.

PENNSYLVANIA.

CLIFTON HEIGHTS. The Linen Wear Hosiery Co. has increased its capital stock from $50,000 to $100,000. This company is engaged in the manufacture of fine gauge cotton hosiery.

TENNESSEE.

HARRIMAN. The Harriman Hosiery Mill some time ago let the contract for the new building which will be used by the company. There is to be a two story building 60 by 150; a one story building 50 by 150, and a one story building 35 by 70 feet. These buildings will be of brick, mill construction. The engineers in charge are Adams & Scheiter of Chattanooga.

NASHVILLE. The addition to the May Hosiery Mills has been completed and contains something over 10,000 square feet of floor space. The building is to be utilized for inspectors which have been moved to make room for 76 knitting machines. About 300 operatives are employed.

Weighténing Softner

A SOLUBLE GUM to be used in either Sizing or Finishing. It is especially valuable in the finishing of cotton fabric, when used together with Bradford Soluble Grease. By using these two articles any desired finish may be had, when used in the proper proportions. Weightening Softner is also an excellent binder for weightening materials. Manufacturers of tickings use it extensively for this purpose in conjunction with China Clay. It does not gum the pins. Write for finishing recipe.

ARABOL MFG. CO.

100 William Street NEW YORK

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CAMERON MacRAE CHARLOTTE. N. C.

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